Automation and control

Soft starters and variable speed drives

Catalogue

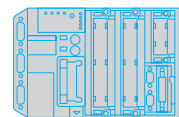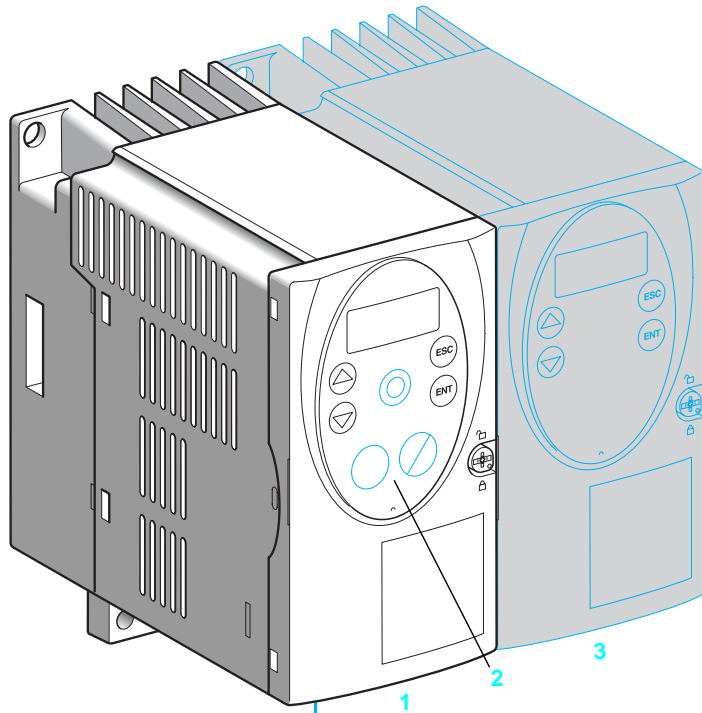# 2007/2008

Telemecanique

Presentation

**Variable speed drives
for asynchronous motors**
Altivar 31

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Telemecanique

Variable speed drives
for asynchronous motors
Altivar 31

Applications

The Altivar 31 drive is a frequency inverter for 3-phase squirrel cage asynchronous motors. The Altivar 31 is robust, compact and easy to set up. It conforms to EN 50178, IEC/EN 61800-2 and IEC/EN 61800-3 standards, UL and CSA certification and the relevant European directives (C€ marking).

It incorporates functions that are suitable for the most common applications, including:
■ Materials handling (small conveyors, hoists, etc)
■ Packing and packaging machines
■ Specialist machines (mixers, kneaders, textile machines, etc.)
■ Pumps, compressors, fans

Altivar 31 drives communicate on Modbus and CANopen industrial buses. Both these protocols are integrated as standard in the drive.

Altivar 31 drives are supplied with a heatsink for normal environments and ventilated enclosures. Several units can be mounted side-by-side **3**, to save space.

Drives are available for motor ratings ranging from 0.18 kW to 15 kW, with four types of power supply:
■ 200 V to 240 V single phase, 0.18 kW to 2.2 kW
■ 200 V to 240 V three phase, 0.18 kW to 15 kW
■ 380 V to 500 V three phase, 0.37 kW to 15 kW
■ 525 V to 600 V three phase, 0.75 kW to 15 kW

Altivar 31 drives are available with a choice of two different human-machine interfaces:
■ **1 ATV 31H●●●●** with displays and menu navigation keys
■ **2 ATV 31H●●●●A** with displays, menu navigation keys and local control (Run/Stop and speed reference set by a potentiometer).

Electromagnetic compatibility EMC

The incorporation of EMC filters in **ATV 31H●●●M2** and **ATV 31H●●●N4** drives simplifies installation and provides an economical means of ensuring machines meet C€ marking requirements
ATV 31H●●●M3X and **ATV 31H●●●S6X** drives are available without EMC filter. Filters are available as an option and can be installed by the user if conformity to EMC standards is required (see pages 2/120 and 2/121).

Functions

The Altivar 31 drive has six logic inputs, three analog inputs, one logic/analog output and two relay outputs.
The main functions integrated in the drive are as follows:
■ Motor and drive protection
■ Linear, S, U or customized acceleration and deceleration ramps
■ +/- speed
■ 16 preset speeds
■ PI regulator and references
■ 2-wire/3-wire control
■ Brake sequence
■ Automatic catching a spinning load with speed detection and automatic restart
■ Fault configuration and stop type configuration
■ Saving the configuration in the drive
Several functions can be assigned to one logic input.

Options and accessories

The following options and accessories can be used with the Altivar 31 drive:
■ Braking resistors
■ Line chokes
■ EMC radio interference input filters and output filters
■ Plates for mounting on ⌐⌐ rail
■ UL Type 1 conformity kit
■ Adaptor plate for replacing an Altivar 28 drive

Characteristics:
pages 2/108 to 2/111

References:
pages 2/112 to 2/115

Dimensions:
pages 2/126 to 2/131

Schemes:
pages 2/132 to 2/135

Functions:
pages 2/140 to 2/157

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Variable speed drives
for asynchronous motors
Altivar 31
Enclosed drives

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⊞ **Telemecanique**

Variable speed drives
for asynchronous motors
Altivar 31
Enclosed drives

Applications

The enclosed Altivar 31 drive is suitable for applications requiring an IP 55 degree of protection in a hostile environment.

This enclosed range of drives is available for motor ratings between 0.18 kW and 15 kW, with two types of power supply:
■ 200 V to 240 V single phase, 0.18 kW and 2.2 kW
■ 380 V to 500 V three phase, 0.37 kW and 15 kW

Up to 2.2 kW in single phase supply and 4 kW in three phase supply, the drive is supplied in a customizable enclosure suitable for ready-to-use motor starter applications. Above these power ratings, the drive is supplied in a standard enclosure.

These enclosures can be installed next to the motor.

Customizable enclosed drive (0.18 kW to 4 kW)

This range allows full customization of the human-machine interface part of the enclosure.
The IP 55 enclosure includes:
■ A drive **1** with external heatsink
■ Removable covers **6** to **9** for adding the following components:
6 Vario switch disconnector or GV2 circuit-breaker
7 3 buttons and/or LEDs with plastic flange (Ø 22) and 1 speed reference potentiometer
8 1 blanking plug for the RJ45 connector with IP 55 cable
9 Cable glands for cable routing

The combinations (circuit-breaker, contactor, drive) required for the motor starter function can be found on pages 2/138.
Example references:
■ 3-pole Vario switch disconnector (V●● + KC● 1●Z)
■ Selector switch with 3 fixed positions XB5 D33
■ LED XB5 AV●●
■ 2.2 kΩ potentiometer VW3 A58866
These references can be found in our specialist "Motor starter solutions-Control and protection components" and "Components for Human-Machine Interfaces" catalogues.
All components must be ordered separately and wired by the customer.

Standard enclosed drive (5.5 kW to 15 kW)

This enclosure includes a drive **2** with external heatsink and fans and a blanking plug **10** for the RJ45 connector with IP 55 cable.

The combinations (circuit-breaker, contactor, drive) required for the motor starter function can be found on page 2/138.

Electromagnetic compatibility EMC

The incorporation of EMC filters in **ATV 31C●●●M2** and **ATV 31C●●●N4** enclosed drives simplifies installation and provides an economical means of ensuring machines meet C€ marking requirements.

Options and accessories

The following options and accessories can be used with the enclosed Altivar 31 drive:
■ Braking resistors
■ Line chokes
■ Output filters and motor chokes
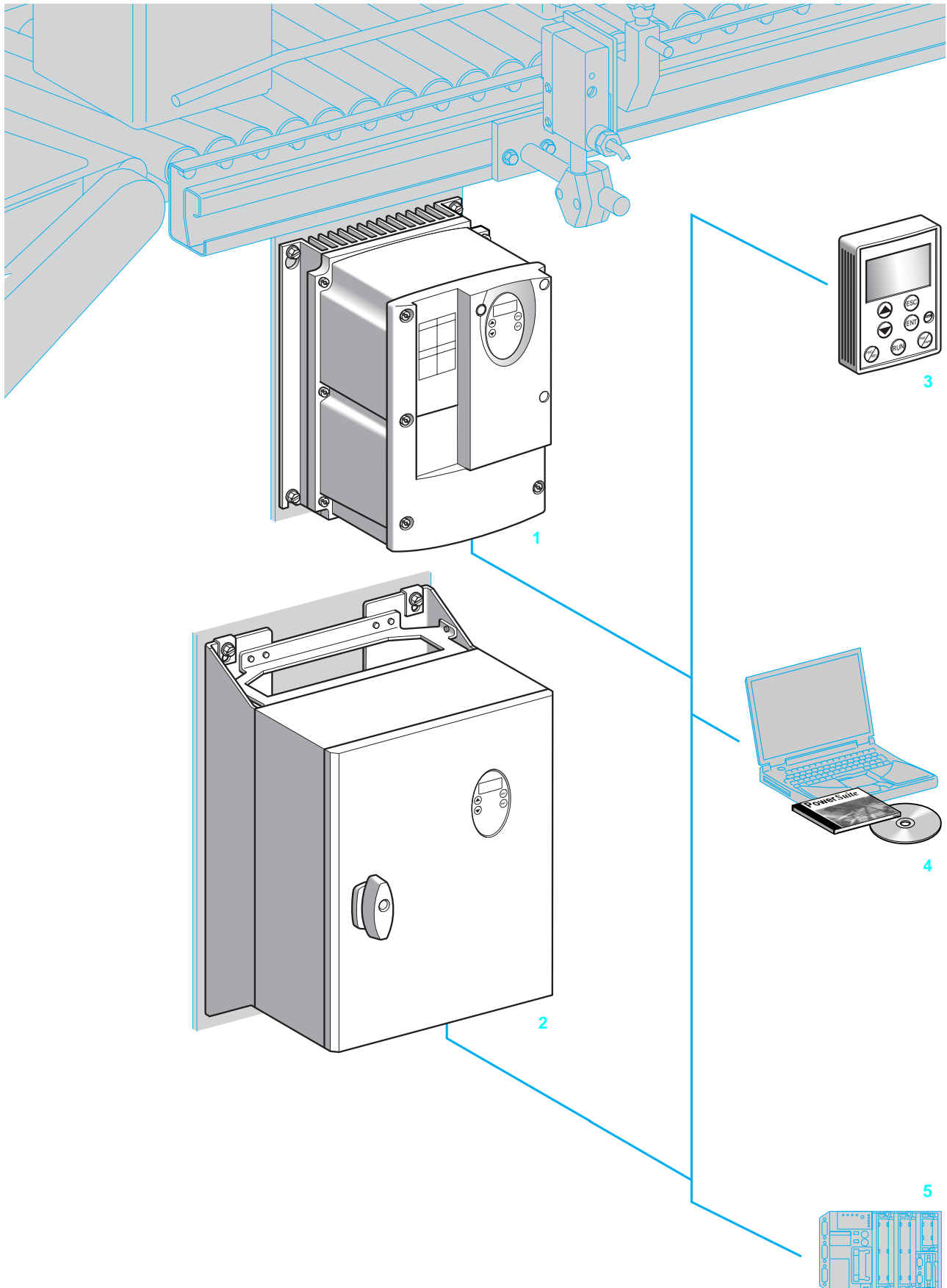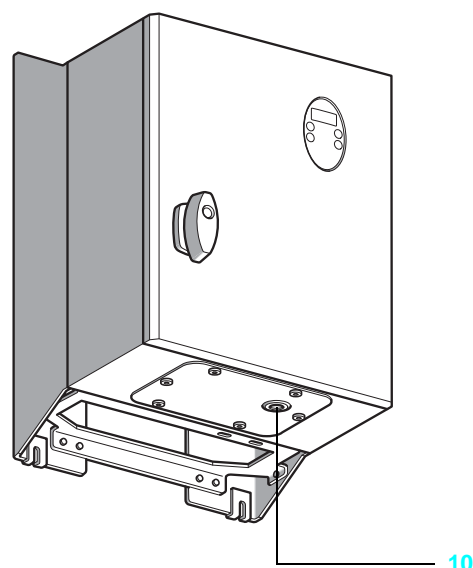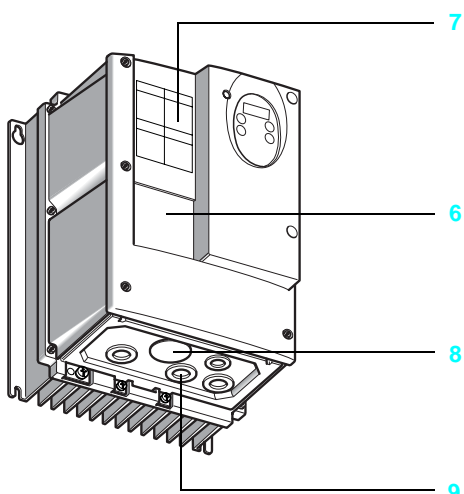■ IP 55 cables equipped with RJ45 connectors for control via Modbus

Various dialogue and communication options **3, 4, 5** can be used with the drive (see pages 2/106 and 2/107).

Variable speed drives for asynchronous motors
Altivar 31
Drive kits

Applications

The drive kit is another standard solution available in the Altivar 31 drives offer.
The drive kit comprises:
- Altivar 31 drive elements (heatsink, power and control subassemblies)
- EMC filter
- Mechanical adaptors
- Seals required for use in difficult environments (IP 55)

The kit is mounted on a metal mounting support with no flange or protective cover.
The Altivar 31 drive kit can be built into a floor-standing or wall-mounted enclosure or mounted on a machine frame.

The drive kit is available for motor ratings between 0.18 kW and 15 kW, with two types of power supply:
- 200 V to 240 V single phase, 0.18 kW to 2.2 kW
- 380 V to 500 V three phase, 0.37 kW to 15 kW

Electromagnetic compatibility EMC

The incorporation of EMC filters in **ATV 31K●●●M2** and **ATV 31K●●●N4** drives simplifies installation and provides an economical means of ensuring machines meet C€ marking requirements. They are sized to conform to standard IEC/EN61800-3, domestic and industrial environments.

Description

- Drive kit for power ratings ≤ 4 kW **1**

The Altivar 31 drive components (heatsink, power and control subassemblies) are held in place by mechanical adaptors **2** and protective fittings.
The unit is supported by a metal plate **3** mounted on the heatsink.
A seal **4** is attached all around the plate.
Once the support has been cut out, the drive kit is mounted on the base of the floor-standing or wall-mounted enclosure by means of this plate.
The power terminals **5** are protected (IP 20).

- Drive kit for power ratings ≥ 5.5 kW **6**

The Altivar 31 drive components (heatsink, power and control subassemblies) are held in place by mechanical adaptors **11** and protective fittings.
The metal support plate **7** for the components is equipped with brackets **10** for mounting in a floor-standing or wall-mounted enclosure.
A seal **8** is attached all around the plate.
Two fans are installed behind the plate under the heatsink.
Additional mounting holes **9** are provided for mounting components (GV2 circuit-breaker, Vario switch disconnector, contactor, additional plate, etc.).

Drive kits are supplied with:
- A cutting and drilling template
- A user's manual with installation instructions and safety precautions.

Options and accessories

The following options and accessories can be used with the Altivar 31 drive kit:
- Braking resistors
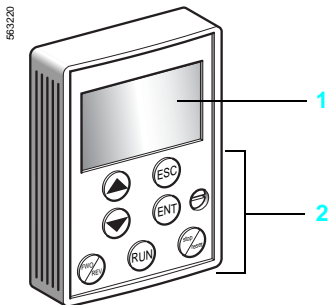- Line chokes
- Output filters and motor chokes

Variable speed drives
for asynchronous motors
Altivar 31
Dialogue options

Presentation

The Altivar 31 drive communicates with the following options:
■ Remote display terminal
■ PowerSuite software workshop
■ Ethernet/Modbus bridge
■ Communication gateways

The communication function provides access to the drive's configuration,
adjustment, control and signalling functions.

Remote terminal

The Altivar 31 can be connected to a remote display terminal.
The remote display terminal can be mounted on the door of an enclosure with IP 65
protection on the front panel.
The terminal provides access to the same functions as the integrated display and
keypad on the drive, see page 2/141.

It can be used:
■ To control, adjust and configure the drive remotely
■ For visible remote signalling
■ To save and download configurations; 4 configuration files can be saved.

Description
1 Display
□ Four 7-segment displays visible at 5 m
□ Displays numeric values and codes
□ The display flashes when a value is stored.
□ The display flashes to indicate a fault on the drive.

2 Use of keys:
□ Navigation arrows and ENT, ESC for settings and configurations
□ FWD/REV key: reverses the direction of rotation of the motor
□ RUN key: motor run command
□ STOP/RESET key: motor stop command or drive fault reset

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Variable speed drives
for asynchronous motors
Altivar 31
Communication options
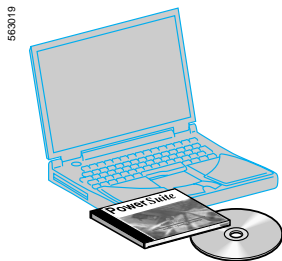
PowerSuite software workshop

PowerSuite software workshop

The PowerSuite software workshop offers the following advantages:
■ Messages can be displayed in plain text and in multiple languages
■ Work can be prepared in the design office without connecting the drive to the PC
■ Configurations and settings can be saved to floppy disk or hard disk and downloaded to the drive
■ Settings can be printed out
■ Altivar 28 files can be read and imported into the Altivar 31

See pages 3/2 to 3/5.

Ethernet/Modbus bridge

The Altivar 31 can be connected to an Ethernet network via an Ethernet/Modbus bridge.
Ethernet communication is primarily intended for the following applications:
■ Coordination between PLCs
■ Local or centralized supervision
■ Communication with production management software
■ Communication with remote I/O
■ Communication with industrial control products

See pages 2/124 and 2/125.

Communication gateways

The Altivar 31 can connect to other communication buses by means of the following gateways:
■ Fipio/Modbus
■ DeviceNet/Modbus
■ Profibus DP/Modbus

See pages 2/124 and 2/125.
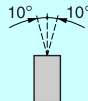

Communication gateways

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| Characteristics: pages 2/108 to 2/111 | References: pages 2/112 to 2/115 | Dimensions: pages 2/126 to 2/131 | Schemes: pages 2/132 to 2/135 | Functions: pages 2/140 to 2/157 |

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Variable speed drives
for asynchronous motors
Altivar 31

Environmental characteristics

Conformity to standards			Altivar 31 drives have been developed to conform to the strictest international standards and the recommendations relating to electrical industrial control devices (IEC, EN), in particular: low-voltage EN 50178, EMC immunity and EMC conducted and radiated emissions.
	EMC immunity		IEC/EN 61000-4-2 level 3 IEC/EN 61000-4-3 level 3 IEC/EN 61000-4-4 level 4 IEC/EN 61000-4-5 level 3 (power part) IEC/EN 61800-3, environments 1 and 2
	EMC conducted and radiated emissions for drives		
		All drives	IEC/EN 61800-3, environments: 2 (industrial supply) and 1 (public supply), restricted distribution
		ATV 31H018M2...HU15M2, ATV 31C018M2...CU15M2, ATV 31H037N4...HU40N4, ATV 31C037N4...CU40N4	EN 55011 class A group 1, EN 61800-3 category C2 With additional EMC filter: ■ EN 55022 class B group 1, EN 61800-3 category C1
		ATV 31HU22M2, ATV 31CU22M2, ATV 31HU55N4...HD15N4, ATV 31CU55N4...CD15N4	EN 55011 class A group 2, EN 61800-3 category C3 With additional EMC filter *(1)* : ■ EN 55022 class A group 1, EN 61800-3 category C2 ■ EN 55022 class B group 1, EN 61800-3 category C1
		ATV 31H018M3X...HD15M3X, ATV 31H075S6X....HD15S6X	With additional EMC filter *(1)*: ■ EN 55011 class A group 1, EN 61800-3 category C2 ■ EN 55022 class B group 1, EN 61800-3 category C1
CE marking			The drives carry CE marking in accordance with the European low voltage (73/23/EEC and 93/68/EEC) and EMC (89/336/EEC) directives
Product certifications	All drives		C-Tick
	ATV 31H/K●●●●●, ATV 31H●●●●●X, ATV 31C●●●M2, ATV 31C037N4…CU40N4		UL, CSA, N998
Degree of protection	ATV 31H●●●M2, ATV 31H●●●N4, ATV 31H●●●M3X, ATV 31H●●●S6X		IP 31 and IP 41 on upper part and IP 21 on connection terminals IP 20 without cover plate on upper part of cover
	ATV 31C●●●M2, ATV 31C●●●N4		IP 55
Degree of pollution			2
Climatic treatment			TC
Vibration resistance	Drive without rail option ⌐_⌐		Conforming to IEC/EN 60068-2-6: 1.5 mm peak to peak from 3 to 13 Hz, 1 gn from 13 to 150 Hz
Shock resistance			15 gn for 11 ms conforming to IEC/EN 60068-2-27
Relative humidity		**%**	5…95 without condensation or dripping water, conforming to IEC 60068-2-3
Ambient temperature around the unit	Storage	**°C**	- 25…+ 70
	Operation		
	ATV 31H●●●	**°C**	-10…+50 without derating, with protective cover on top of the drive -10…+60 with derating, without protective cover on top of the drive (see derating curves, page 2/134)
	ATV 31C/K●●●	**°C**	-10…+40 without derating
Maximum operating altitude		**m**	1000 without derating (above this, derate the current by 1% per additional 100 m)
Operating position Maximum permanent angle in relation to the normal vertical mounting position			10° 10°

Drive characteristics

Output frequency range		**Hz**	0…500
Switching frequency		**kHz**	2…16 adjustable during operation
Speed range			1…50
Transient overtorque			170 to 200% of nominal motor torque (typical value)
Braking torque	With braking resistor		100% of nominal motor torque continuously and up to 150% for 60 s
	Without braking resistor		Value of nominal motor torque (typical value) according to ratings: 30% for > ATV 31●U15●● 50% for ≤ ATV 31●U15●● 100% for ≤ ATV 31●075●● 150% for ≤ ATV 31●018M2
Maximum transient current			150% of the nominal drive current for 60 seconds (typical value)
Voltage/frequency ratio			Sensorless flux vector control with PWM *(Pulse Width Modulation)* type motor control signal Factory-set for most constant torque applications Possible options: specific ratios for pumps and fans, energy saving or constant torque U/f for special motors
Frequency loop gain			Factory-set with the speed loop stability and gain Possible options for machines with high resistive torque or high inertia, or for machines with fast cycles
Slip compensation			Automatic whatever the load. Can be suppressed or adjusted

(1) See table on page 2/121 to check permitted cable lengths.

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Variable speed drives
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Electrical characteristics

Power supply	Voltage	**V**	200 -15% … 240 +10% single phase for ATV 31●●●●M2 200 -15% … 240 +10% 3-phase for ATV 31●●●●M3X 380 -15% … 500 +10% 3-phase for ATV 31●●●●N4 525 -15% … 600 +10% 3-phase for ATV 31●●●●S6X
	Frequency	**Hz**	50 -5% … 60 +5%
Prospective short-circuit current ISC	For drives		
	ATV 31●●●●M2	**A**	≤ 1000 (ISC at connection point) for single phase power supply
	ATV 31H018M3X…HU40M3X, ATV 31H/C/K037N4…H/C/KU40N4, ATV 31H075S6X…HU40S6X	**A**	≤ 5000 (ISC at connection point) for 3-phase power supply
	ATV 31HU55M3X…HD15M3X, ATV 31HU55N4…HD15N4, ATV 31CU55N4…CD15N4, ATV 31KU55N4…KD15N4, ATV 31HU55S6X…HD15S6X	**A**	≤ 22000 (ISC at connection point) for 3-phase power supply
Output voltage			Maximum 3-phase voltage equal to line supply voltage
Maximum connection capacity and tightening torque of the power supply terminals, motor, braking module and DC bus	For drives		
	ATV 31H/C/K018M2…H/C/K075M2, ATV 31H018M3X…HU15M3X		2.5 mm² (AWG 14) 0.8 Nm
	ATV 31H/C/KU11M2…H/C/KU22M2, ATV 31HU22M3X…HU40M3X, ATV 31H/C/K037N4…H/C/KU40N4, ATV 31H075S6X…HU40S6X		5 mm² (AWG 10) 1.2 Nm
	ATV 31HU55M3X, HU75M3X, ATV 31H/C/KU55N4, H/C/KU75N4, ATV 31HU55S6X, HU75S6X		16 mm² (AWG 6) 2.2 Nm
	ATV 31HD11M3X, HD15M3X, ATV 31H/C/KD11N4, H/C/KD15N4, ATV 31HD11S6X, HD15S6X		25 mm² (AWG 3) 4 Nm
Electrical isolation			Electrical isolation between power and control (inputs, outputs, power supplies)
Internal supplies available			Short-circuit and overload protection: ■ One +10 V (0/+8%) supply for the reference potentiometer (2.2 to 10 kΩ), maximum current 10 mA ■ One +24 V supply (min. 19 V, max. 30 V) for logic inputs, maximum current 100 mA
Configurable analog inputs	AI1		Analog voltage input 0 to +10V, impedance 30 kΩ, maximum safe voltage 30 V
	AI2		Analog bipolar voltage input ±10 V, impedance 30 kΩ, maximum safe voltage 30 V
	AI3		Analog current input X-Y mA by programming X and Y from 0 to 20 mA, with impedance 250Ω
			AIP: potentiometer reference for ATV 31●●●●●●A only Max. sampling time: 8 ms 10-bit resolution Precision ± 4.3% Linearity ± 0.2% of maximum value Use: ■ 100 m maximum with shielded cable ■ 25 m maximum with unshielded cable
Analog voltage or current outputs configurable as logic outputs			2 assignable analog outputs AOV and AOC These outputs cannot be used at the same time
	AOV		Analog voltage output 0..+10 V, minimum load impedance 470 Ω 8-bit resolution, precision ±1%, linearity ±0.2%
	AOC		Analog current output 0…20 mA, maximum load impedance 800 Ω 8-bit resolution, precision ±1%, linearity ±0.2% This AOC analog output can be configured as a 24 V logic output, max. 20 mA, minimum load impedance 1.2 kΩ Max. sampling time: 8 ms
Configurable relay outputs	R1A, R1B, R1C		1 relay logic output, one "N/C" contact and one "N/O" contact with common point. Minimum switching capacity: 10 mA for ⎓ 5 V Maximum switching capacity: ■ on resistive load (cos φ = 1 and L/R = 0 ms): 5 A for ∿ 250 V or ⎓ 30 V, ■ on inductive load (cos φ = 0.4 and L/R = 7 ms): 2 A for ∿ 250 V or ⎓ 30 V Max. sampling time: 8 ms Switching: 100,000 operations
	R2A, R2B		1 relay logic output, one "N/C" contact, contact open on fault. Minimum switching capacity: 10 mA for ⎓ 5 V Maximum switching capacity: ■ on resistive load (cos φ = 1 and L/R = 0 ms): 5 A for ∿ 250 V or ⎓ 30 V, ■ on inductive load (cos φ = 0.4 and L/R = 7 ms): 2 A for ∿ 250 V or ⎓ 30 V Max. sampling time: 8 ms Switching: 100,000 operations

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Characteristics (continued)

Variable speed drives
for asynchronous motors
Altivar 31

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Electrical characteristics (continued)

Logic inputs LI	LI1…LI6		6 programmable logic inputs Impedance 3.5 kΩ + 24 V internal or 24 V external power supply (min. 19 V, max. 30 V) Max. current: 100 mA Max. sampling time: 4 ms Multiple assignment makes it possible to configure several functions on one input (example: LI1 assigned to forward and preset speed 2, LI3 assigned to reverse and preset speed 3)
	Positive logic		State 0 if < 5 V or logic input not wired, state 1 if > 11 V
	Negative logic		State 0 if > 19 V or logic input not wired, state 1 if < 13 V
	CLI position		Connection to PLC output (see diagram, page 2/132)
Maximum I/O connection capacity and tightening torque			2.5 mm² (AWG 14) 0.6 Nm
Acceleration and deceleration ramps			Ramp profiles: ■ Linear, can be adjusted separately from 0.1 to 999.9 s ■ S, U or customized Automatic adaptation of deceleration ramp time if braking capacities are exceeded, possible inhibition of this adaptation (use of braking resistor)
Braking to a standstill			By d.c. injection: ■ by a signal on a programmable logic input ■ automatically as soon as the estimated output frequency drops to < 0.5 Hz, period adjustable from 0 to 30 s or continuous, current adjustable from 0 to 1.2 In
Main protection and safety features of the drive			Thermal protection against overheating Protection against short-circuits between motor phases Protection against input phase breaks Protection against motor phase breaks Protection against overcurrent between output phases and earth Line supply overvoltage and undervoltage safety circuits Line supply phase loss safety function, for 3-phase supply
Motor protection (see page 2/153)			Thermal protection integrated in the drive by continuous calculation of the I^2t
Dielectric strength	Between earth and power terminals		2040 V $=$ for ATV 31●●●●M2 and M3X, 2410 V $=$ for ATV 31●●●●N4, 2550 V $=$ for ATV 31●●●●S6X
	Between control and power terminals		2880 V $\sim$ for ATV 31●●●●M2 and M3X, 3400 V $\sim$ for ATV 31●●●●N4, 3600 V $\sim$ for ATV 31●●●●S6X
Insulation resistance to earth			> 500 MΩ (electrical isolation) 500 V $=$ for 1 minute
Signalling			1 red LED on front: LED lit indicates the presence of drive voltage Display coded by four 7-segment display units displaying the CANopen bus status (RUN and ERR).
Frequency resolution	Display units	**Hz**	0.1
	Analog inputs	**Hz**	0.1 …100 Hz (calculate (high speed – low speed)/1024)
Time constant for reference change		**ms**	5
Communication			Modbus and CANopen are integrated into the drive and available via an RJ45 connector
	Modbus		RS 485 multidrop serial link Modbus in RTU mode Services supported: decimal function codes 03, 06, 16, 23 and 43 Broadcasting Number of addresses: drive address can be configured via the integrated terminal from 1 to 247 Maximum number of Altivar 31 drives connected: 31 Transmission speed: 4800, 9600 or 19200 bps Used for connecting: ■ the remote terminal (option) ■ the PowerSuite software workshop ■ a PLC ■ a microprocessor card ■ a PC
	CANopen		To connect the ATV31 drive on the CANopen bus, use the VW3 CANTAP2 adapter Services supported: ■ Implicit exchange of Process Data Object - 2 PDOs depending on DSP 402 velocity mode - 2 configurable PDOs (data and transmission type) - PDOs can be exchanged between slaves. ■ Explicit exchange of Service Data Object - 1 receive SDO and 1 transmit SDO ■ Boot-up messages, emergency messages, node guarding and producer and consumer heartbeat, sync and NMT Number of addresses: drive address can be configured via the integrated terminal from 1 to 127 Maximum number of Altivar 31 drives connected: 127 Transmission speed: 10, 20, 50, 125, 250, 500 kbps or 1 Mbps

Variable speed drives
for asynchronous motors
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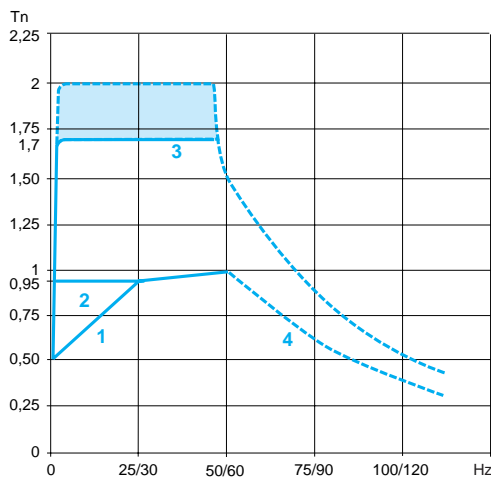
1 Self-cooled motor: continuous useful torque *(1)*
2 Force-cooled motor: continuous useful torque
3 Transient overtorque 1.7 to 2 Tn
4 Torque in overspeed at constant power *(2)*
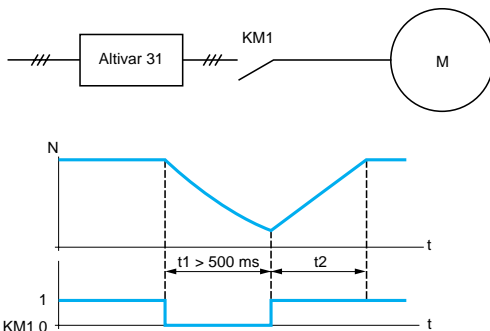
KM1: contactor
t1: KM1 opening time (motor freewheeling)
t2: acceleration with ramp
N: speed

Example of breaking of downstream contactor

Torque characteristics (typical curves)
The curves opposite define the available continuous torque and transient overtorque for both force-cooled and self-cooled motors. The only difference is in the ability of the motor to provide a high continuous torque at less than half the nominal speed.

Special uses
Use with a motor with a different rating to that of the drive
The device can supply any motor which has a power rating lower than that for which it is designed.
For motor ratings slightly higher than that of the drive, check that the current taken does not exceed the continuous output current of the drive.

Test on a low power motor or without a motor
In a testing or maintenance environment the drive can be checked without having to switch to a motor with the same rating as the drive (particularly useful in the case of high power drives). This use requires deactivation of motor phase loss detection.

Connecting motors in parallel
The nominal current of the drive must be greater than or equal to the sum of the currents of the motors to be controlled.
In this case, external thermal protection must be provided for each motor using probes or LRD thermal bimetal overload relays designed for 1.2 times the nominal current of the motor.
If the number of motors connected in parallel is greater than or equal to 3, it is advisable to install a motor choke between the drive and the motors.

Switching the motor at the drive output
The drive can be switched when locked or unlocked. If the drive is switched on-the-fly (drive unlocked), the motor is controlled and accelerates until it reaches the reference speed smoothly following the acceleration ramp.
This use requires configuration of automatic catching a spinning load ("catch on-the-fly"), activation of the function which manages the presence of a downstream contactor and addition of ferrite suppressors at the drive output, see page 2/123.

Typical applications: loss of safety circuit at drive output, bypass function, switching of motors connected in parallel

Operating recommendations: synchronize the control of the downstream contactor with that of a freewheel stop request sent by the drive on a logic input.

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(1) For power ratings ≤ 250 W, the motor is derated to a lesser extent (20% instead of 50% at very low frequencies).
(2) The nominal motor frequency and the maximum output frequency can be adjusted from 40 to 500 Hz.
Note: Check the mechanical overspeed characteristics of the selected motor with the manufacturer.

Variable speed drives
for asynchronous motors
Altivar 31
Drives with heatsink

ATV 31H037M2

2

2.3

ATV 31HU40M3X

ATV 31HU75N4

ATV 31HD15N4A

Drives with heatsink (frequency range from 0.5 to 500 Hz)

Motor		Line supply				Altivar 31				
Power indicated on rating plate *(1)*		Line current *(2)*		Apparent power	Max. prospective line Isc *(4)*	Nominal current	Max. transient current for 60 s	Power dissipated at nominal load	Reference *(5)*	Weight
		at U1	at U2 *(3)*			4 kHz				
kW	*HP*	A	A	kVA	kA	A	A	W		kg
Single phase supply voltage: 200…240 V 50/60 Hz, with integrated EMC filters										
0.18	*0.25*	3.0	2.5	0.6	1	1.5	2.3	24	**ATV 31H018M2** *(6)*	1.500
0.37	*0.5*	5.3	4.4	1	1	3.3	5	41	**ATV 31H037M2** *(6)*	1.500
0.55	*0.75*	6.8	5.8	1.4	1	3.7	5.6	46	**ATV 31H055M2** *(6)*	1.500
0.75	*1*	8.9	7.5	1.8	1	4.8	7.2	60	**ATV 31H075M2** *(6)*	1.500
1.1	*1.5*	12.1	10.2	2.4	1	6.9	10.4	74	**ATV 31HU11M2** *(6)*	1.800
1.5	*2*	15.8	13.3	3.2	1	8	12	90	**ATV 31HU15M2** *(6)*	1.800
2.2	*3*	21.9	18.4	4.4	1	11	16.5	123	**ATV 31HU22M2** *(6)*	3.100
3-phase supply voltage: 200…240 V 50/60 Hz, without EMC filters *(7)*										
0.18	*0.25*	2.1	1.9	0.7	5	1.5	2.3	23	**ATV 31H018M3X** *(6)*	1.300
0.37	*0.5*	3.8	3.3	1.3	5	3.3	5	38	**ATV 31H037M3X** *(6)*	1.300
0.55	*0.75*	4.9	4.2	1.7	5	3.7	5.6	43	**ATV 31H055M3X** *(6)*	1.300
0.75	*1*	6.4	5.6	2.2	5	4.8	7.2	55	**ATV 31H075M3X** *(6)*	1.300
1.1	*1.5*	8.5	7.4	3	5	6.9	10.4	71	**ATV 31HU11M3X** *(6)*	1.700
1.5	*2*	11.1	9.6	3.8	5	8	12	86	**ATV 31HU15M3X** *(6)*	1.700
2.2	*3*	14.9	13	5.2	5	11	16.5	114	**ATV 31HU22M3X** *(6)*	1.700
3	*–*	19.1	16.6	6.6	5	13.7	20.6	146	**ATV 31HU30M3X** *(6)*	2.900
4	*5*	24.2	21.1	8.4	5	17.5	26.3	180	**ATV 31HU40M3X** *(6)*	2.900
5.5	*7.5*	36.8	32	12.8	22	27.5	41.3	292	**ATV 31HU55M3X** *(6)*	6.400
7.5	*10*	46.8	40.9	16.2	22	33	49.5	388	**ATV 31HU75M3X** *(6)*	6.400
11	*15*	63.5	55.6	22	22	54	81	477	**ATV 31HD11M3X** *(6)*	10.500
15	*20*	82.1	71.9	28.5	22	66	99	628	**ATV 31HD15M3X** *(6)*	10.500
3-phase supply voltage: 380…500 V 50/60 Hz, with integrated EMC filters										
0.37	*0.5*	2.2	1.7	1.5	5	1.5	2.3	32	**ATV 31H037N4** *(6)*	1.800
0.55	*0.75*	2.8	2.2	1.8	5	1.9	2.9	37	**ATV 31H055N4** *(6)*	1.800
0.75	*1*	3.6	2.7	2.4	5	2.3	3.5	41	**ATV 31H075N4** *(6)*	1.800
1.1	*1.5*	4.9	3.7	3.2	5	3	4.5	48	**ATV 31HU11N4** *(6)*	1.800
1.5	*2*	6.4	4.8	4.2	5	4.1	6.2	61	**ATV 31HU15N4** *(6)*	1.800
2.2	*3*	8.9	6.7	5.9	5	5.5	8.3	79	**ATV 31HU22N4** *(6)*	3.100
3	*–*	10.9	8.3	7.1	5	7.1	10.7	125	**ATV 31HU30N4** *(6)*	3.100
4	*5*	13.9	10.6	9.2	5	9.5	14.3	150	**ATV 31HU40N4** *(6)*	3.100
5.5	*7.5*	21.9	16.5	15	22	14.3	21.5	232	**ATV 31HU55N4** *(6)*	6.500
7.5	*10*	27.7	21	18	22	17	25.5	269	**ATV 31HU75N4** *(6)*	6.500
11	*15*	37.2	28.4	25	22	27.7	41.6	397	**ATV 31HD11N4** *(6)*	11.000
15	*20*	48.2	36.8	32	22	33	49.5	492	**ATV 31HD15N4** *(6)*	11.000
3-phase supply voltage: 525…600 V 50/60 Hz, without EMC filters										
0.75	*1*	2.8	2.4	2.5	5	1.7	2.6	36	**ATV 31H075S6X**	1.700
1.5	*2*	4.8	4.2	4.4	5	2.7	4.1	48	**ATV 31HU15S6X**	1.700
2.2	*3*	6.4	5.6	5.8	5	3.9	5.9	62	**ATV 31HU22S6X**	2.900
4	*5*	10.7	9.3	9.7	5	6.1	9.2	94	**ATV 31HU40S6X**	2.900
5.5	*7.5*	16.2	14.1	15	22	9	13.5	133	**ATV 31HU55S6X**	6.200
7.5	*10*	21.3	18.5	19	22	11	16.5	165	**ATV 31HU75S6X**	6.200
11	*15*	27.8	24.4	25	22	17	25.5	257	**ATV 31HD11S6X**	10.000
15	*20*	36.4	31.8	33	22	22	33	335	**ATV 31HD15S6X**	10.000

(1) These power ratings are for a maximum switching frequency of 4 kHz, in continuous operation. The switching frequency is adjustable from 2 to 16 kHz.
Above 4 kHz, derate the nominal drive current. The nominal motor current should not exceed this value: see derating curves on page 2/134.
(2) Typical value for a 4-pole motor and a maximum switching frequency of 4 kHz, with no additional line choke, for the max. prospective line current.
(3) Nominal supply voltages, min. U1, max. U2 (200-240 V; 380-500 V; 525-600 V).
(4) If line Isc is greater than the values in the table, add line chokes, see page 2/119.
*(5) To order a drive intended for wire guiding applications, add a **T** to the end of the reference for the selected drive.*
*Example: **ATV 31H018M2T**.*
*(6) To order a drive with potentiometer, add an **A** to the end of the reference for the selected drive.*
*Example: **ATV 31H018M2A**.*
(7) Optional EMC filter, see page 2/121.

Telemecanique

Variable speed drives
for asynchronous motors
Altivar 31
Enclosed drives

ATV 31CU22M2

ATV 31CU75N4

Enclosed drives (frequency range from 0.5 to 500 Hz)

Motor	Line supply				Altivar 31				
Power indicated on rating plate (1)	Line current (2)		Apparent power	Max. prospective line Isc (3)	Nominal current 4 kHz	Max. transient current for 60 s	Power dissipated at nominal load	Reference (4)	Weight
	at U1	at U2							
kW	*HP*	A	A	KVA	kA	A	A	W	kg
Single phase supply voltage: 200…240 V *(5)* **50/60 Hz with integrated EMC filters**									
0.18	*0.25*	3	2.5	0.6	1	1.5	2.3	24	**ATV 31C018M2** *(6)*	6.300
0.37	*0.5*	5.3	4.4	1	1	3.3	5	41	**ATV 31C037M2** *(6)*	6.300
0.55	*0.75*	6.8	5.8	1.4	1	3.7	5.6	46	**ATV 31C055M2** *(6)*	6.300
0.75	*1*	8.9	7.5	1.8	1	4.8	7.2	60	**ATV 31C075M2** *(6)*	6.300
1.1	*1.5*	12.1	10.2	2.4	1	6.9	10.4	74	**ATV 31CU11M2** *(6)*	8.800
1.5	*2*	15.8	13.3	3.2	1	8	12	90	**ATV 31CU15M2** *(6)*	8.800
2.2	*3*	21.9	18.4	4.4	1	11	16.5	123	**ATV 31CU22M2** *(6)*	10.700
3-phase supply voltage: 380…500 V *(5)* **50/60 Hz with integrated EMC filters**									
0.37	*0.5*	2.2	1.7	1.5	5	1.5	2.3	32	**ATV 31C037N4** *(6)*	8.800
0.55	*0.75*	2.8	2.2	1.8	5	1.9	2.9	37	**ATV 31C055N4** *(6)*	8.800
0.75	*1*	3.6	2.7	2.4	5	2.3	3.5	41	**ATV 31C075N4** *(6)*	8.800
1.1	*1.5*	4.9	3.7	3.2	5	3	4.5	48	**ATV 31CU11N4** *(6)*	8.800
1.5	*2*	6.4	4.8	4.2	5	4.1	6.2	61	**ATV 31CU15N4** *(6)*	8.800
2.2	*3*	8.9	6.7	5.9	5	5.5	8.3	79	**ATV 31CU22N4** *(6)*	10.700
3	*–*	10.9	8.3	7.1	5	7.1	10.7	125	**ATV 31CU30N4** *(6)*	10.700
4	*5*	13.9	10.6	9.2	5	9.5	14.3	150	**ATV 31CU40N4** *(6)*	10.700
5.5	*7.5*	21.9	16.5	15.0	22	14.3	21.5	232	**ATV 31CU55N4**	23.600
7.5	*10*	27.7	21.0	18.0	22	17.0	25.5	269	**ATV 31CU75N4**	23.600
11	*15*	37.2	28.4	25.0	22	27.7	41.6	397	**ATV 31CD11N4**	32.500
15	*20*	48.2	36.8	32.0	22	33.0	49.5	492	**ATV 31CD15N4**	32.500

Ready-assembled enclosed drives (frequency range from 0.5 to 500 Hz)

Please consult your Regional Sales Office.

(1) These power ratings are for a maximum switching frequency of 4 kHz, in continuous operation. The switching frequency is adjustable from 2 to 16 kHz.
Above 4 kHz, derate the nominal drive current. The nominal motor current should not exceed this value: see derating curves on page 2/134.
(2) Typical value for a 4-pole motor and a maximum switching frequency of 4 kHz, with no additional line choke, for the max. prospective line current.
(3) If line Isc is greater than the values in the table, add line chokes, see page 2/119.
*(4) To order a drive intended for wire guiding applications, add a **T** to the end of the reference for the selected drive.*
*Example: **ATV 31C018M2T**.*
(5) Nominal supply voltages, min. U1, max. U2 (200-240 V; 380-500 V).
(6) ATV 31C18M2 to ATV 31CU40N4 drives are supplied in customizable enclosures for ready-to-use motor starter applications.

Telemecanique

Variable speed drives for asynchronous motors
Altivar 31
Accessories

Plates for mounting on ⊥⊐ rail

Description	For drives	Reference	Weight kg
Plate for mounting on ⊥⊐ rail, width 35 mm	ATV 31H018M2, ATV 31H037M2, ATV 31H055M2, ATV 31H075M2, ATV 31H018M3X, ATV 31H037M3X, ATV 31H055M3X, ATV 31H075M3X	**VW3 A11851**	0.200
	ATV 31HU11M2, ATV 31HU15M2, ATV 31HU11M3X, ATV 31HU15M3X, ATV 31HU22M3X, ATV 31H037N4, ATV 31H055N4, ATV 31H075N4, ATV 31HU11N4, ATV 31HU15N4, ATV 31H075S6X, ATV 31HU15S6X	**VW3 A31852**	0.220

UL Type 1 conformity kits *(1)*

Description	For drives	Reference	Weight kg
Mechanical device for fixing to the underside of the Altivar 31	ATV 31H018M2, ATV 31H037M2, ATV 31H055M2, ATV 31H075M2	**VW3 A31812**	0.400
	ATV 31H018M3X, ATV 31H037M3X, ATV 31H055M3X, ATV 31H075M3X	**VW3 A31811**	0.400
	ATV 31HU11M3X, ATV 31HU15M3X	**VW3 A31813**	0.400
	ATV 31HU11M2, ATV 31HU15M2, ATV 31HU22M3X, ATV 31H037N4, ATV 31H055N4, ATV 31H075N4, ATV 31HU11N4, ATV 31HU15N4, ATV 31H075S6X, ATV 31HU15S6X	**VW3 A31814**	0.500
	ATV 31HU22M2, ATV 31HU30M3X, ATV 31HU40M3X, ATV 31HU22N4, ATV 31HU30N4, ATV 31HU40N4, ATV 31HU22S6X, ATV 31HU40S6X	**VW3 A31815**	0.500
	ATV 31HU55M3X, ATV 31HU75M3X, ATV 31HU55N4, ATV 31HU75N4, ATV 31HU55S6X, ATV 31HU75S6X	**VW3 A31816**	0.900
	ATV 31HD11M3X, ATV 31HD15M3X, ATV 31HD11N4, ATV 31HD15N4, ATV 31HD11S6X, ATV 31HD15S6X	**VW3 A31817**	1.200

Altivar 28 substitution kits

Description	For drives	Reference	Weight kg
Mechanical adapters allowing an ATV 31 to be used in place of an ATV 28 of the same rating (using the same fixing holes)	ATV 31H018M2, ATV 31H037M2, ATV 31H055M2, ATV 31H075M2, ATV 31H018M3X, ATV 31H037M3X, ATV 31H055M3X, ATV 31H075M3X	**VW3 A31821**	–
	ATV 31HU11M2, ATV 31HU15M2, ATV 31HU11M3X, ATV 31HU15M3X, ATV 31HU22M3X, ATV 31H037N4, ATV 31H075N4, ATV 31HU15N4, ATV 31H075S6X, ATV 31HU15S6X	**VW3 A31822**	–
	ATV 31HU55N4, ATV 31HU75N4, ATV 31HU55M3X, ATV 31HU75M3X, ATV 31HU55S6X, ATV 31HU75S6X	**VW3 A31823**	–

Remote terminal

Description	Reference	Weight kg
For ATV31 drives of all ratings, assembly comprising: - terminal, cable fitted with 2 connectors - seal and screws for IP 65 mounting on an enclosure door	**VW3 A31101**	–

VW3 A31101

Documentation

Description	Reference	Weight kg
Simplified user's manual for ATV 31 and **CD-ROM,** comprising: - Variables user's manual - Modbus and CANopen user's manual	Supplied with the drive	–
International Technical Manual (MIT) CD-ROM	**DCI CD39811**	0.150

(1) This device can be used to connect cables directly to the drive via tubes or cable gland.

⊕ **Telemecanique**

Variable speed drives
for asynchronous motors
Altivar 31
Options: braking resistors
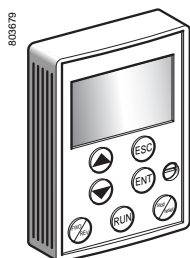
Presentation

The resistor enables the Altivar 31 drive to operate while braking to a standstill or during slowdown braking, by dissipating the braking energy.
Two types of resistors are available:
■ Enclosed model (IP 20 casing) designed to comply with EMC regulations and protected by a temperature-controlled switch or thermal overload relay.
It enables maximum transient braking torque.
The resistors are designed to be mounted on the outside of the enclosure, but should not inhibit natural cooling. Air inlets and outlets must not be obstructed, even partially. The air must be free of dust, corrosive gas and condensation.
■ Non-protected model (IP 00) for lower power ratings only.

Applications

Machines with high inertia, driving loads and machines with fast cycles.

Characteristics

Type of braking resistor			VW3 A58702 to VW3 A58704	VW3 A7 701 to VW3 A7 705
Ambient temperature around the device	Operation	°C	40	0…+ 50
	Storage			- 25…+ 70
Degree of protection of enclosure			IP 00	IP 20
Thermal protection			None	Via temperature controlled switch or via the drive
Temperature controlled switch *(1)*	Tripping temperature	°C	–	120
	Max. voltage - max. current		–	250 V $\sim$ -1 A
	Min. voltage - min. current		–	24 V $=$ -0.1 A
	Maximum contact resistance	mΩ	–	60
Load factor of the dynamic brake transistors			The value of the average power that can be dissipated at 40°C from the resistor into the casing is determined for a load factor during braking that corresponds to the majority of common application. The dynamic brake transistor is designed so that it can tolerate: - continuous nominal motor power, - 150 % of the nominal motor power for 60 s.	

(1) The contact should be connected in sequence (used for signalling or controlling the line contactor).

Load factor and determining the nominal power
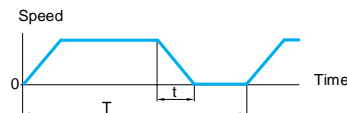
Load factor: $\frac{t}{T}$
t: Braking time in s
T: Cycle time in s

The value of the average power that can be dissipated at 40°C from the resistor into the casing is determined for a load factor during braking that corresponds to the majority of common applications. This load factor is defined in the table above.
For a specific application (e.g. handling), the nominal resistor power has to be redefined by taking account of the new load factor.

Chart 1
Graph of the average power as a function of the braking torque for a load factor
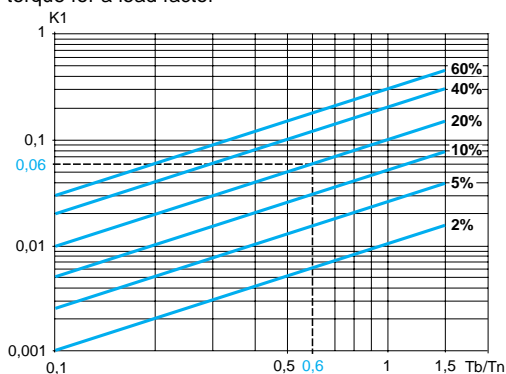
Example:
Motor of power Pm = 4 kW
Motor efficiency η = 0.85
Braking torque Tb = 0.6 Tn
Braking time t = 10 s
Cycle time t = 50 s
Load factor Lf = $\frac{t}{T}$ = 20%

Use chart 1 to determine the coefficient K1 corresponding to a braking torque of 0.6 Tn and a load factor of 20%. K1 = 0.06

Chart 2
Permissible resistor overload as a function of time (characteristic curve)
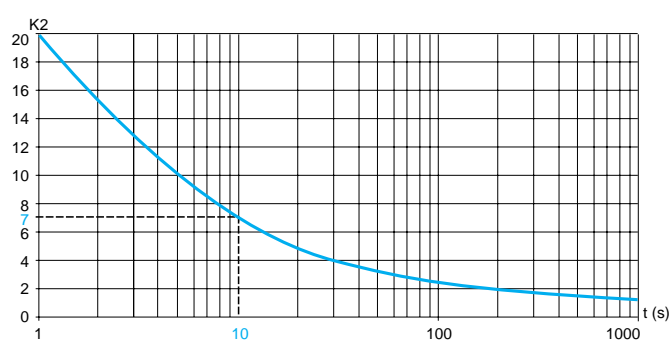
Use chart 2 to determine the coefficient K2 corresponding to a braking time of 10 seconds.
K2 = 7

The nominal resistor power (Pn) must be greater than:

$$Pn = Pm \times K1 \times \eta \left(1 + \frac{1}{K2 \times fm}\right) = 4.10^3 \times 0,06 \times 0,8 \left(1 + \frac{1}{7 \times 0,2}\right) = 350 \text{ W}$$

Telemecanique

Variable speed drives
for asynchronous motors
Altivar 31
Options: braking resistors

531231

VW3 A58702

531232

VW3 A7 701
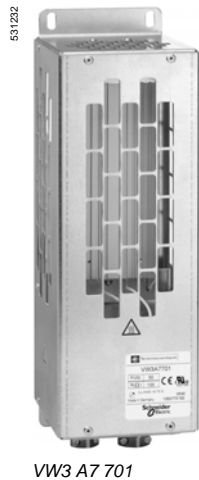
For drives	Minimum resistor value (1)	Ohmic value	Average power available at 40°C (2)	50°C	Reference	Weight
	Ω	Ω	W	W		kg
Non-protected braking resistors						
ATV 31H/C/K018M2, ATV 31H/C/K037M2,	40	100	32	28	**VW3 A58702**	0.600
ATV 31H/C/K055M2, ATV 31H/C/K075M2	40	100	32	28		
ATV 31H/C/KU11M2, ATV 31H/C/KU15M2,	27					
ATV 31H018M3X, ATV 31H037M3X,	40					
ATV 31H055M3X, ATV 31H075M3X,	40					
ATV 31HU11M3X, ATV 31HU15M3X,	27					
ATV 31H/C/K037N4, ATV 31H/C/K055N4,	80					
ATV 31H/C/K075N4,	80					
ATV 31H/C/KU11N4, ATV 31H/C/KU15N4,	54					
ATV 31H/C/KU22N4,	54					
ATV 31H075S6X,	96					
ATV 31HU15S6X, ATV31HU22S6X	64					
ATV 31H/C/KU30N4,	55	100	40	35	**VW3 A58703**	0.850
ATV 31H/C/KU40N4,	36					
ATV 31HU40S6X	44					
ATV 31H/C/KU22M2,	25	68	32	28	**VW3 A58704**	0.600
ATV 31HU22M3X,	25					
ATV 31HU30M3X	16					
Protected braking resistors						
ATV 31H/C/K018M2, ATV 31H/C/K037M2,	40	100	58	50	**VW3 A7 701**	2.000
ATV 31H/C/K055M2, ATV 31H/C/K075M2,	40					
ATV 31H/C/KU11M2, ATV 31H/C/KU15M2,	27					
ATV 31H018M3X, ATV 31H037M3X,	40					
ATV 31H055M3X, ATV 31H075M3X,	40					
ATV 31HU11M3X, ATV 31HU15M3X,	27					
ATV 31H/C/K037N4, ATV 31H/C/K055N4,	80					
ATV 31H/C/K075N4,	80					
ATV 31H/C/KU11N4, ATV 31H/C/KU15N4,	54					
ATV 31H/C/KU22N4	54					
ATV 31H/C/KU22M2,	25	60	115	100	**VW3 A7 702**	2.400
ATV 31HU22M3X,	25					
ATV 31HU30M3X	16					
ATV 31H/C/KU30N4,	55	100	58	50	**VW3 A7 701**	2.000
ATV 31H/C/KU40N4	36					
ATV 31H/C/KU55N4,	29	60	115	100	**VW3 A7 702**	2.400
ATV 31H/C/KU75N4,	19					
ATV 31HU55S6X,	34					
ATV 31HU75S6X	23					
ATV 31HU40M3X,	16	28	231	200	**VW3 A7 703**	3.500
ATV 31H/C/KD11N4, ATV 31H/C/K15N4,	20					
ATV 31HD11S6X, ATV 31HD15S6X	24					
ATV 31HU55M3X, ATV 31HU75M3X	8	15	1154	1000	**VW3 A7 704**	11.000
ATV 31HD11M3X, ATV 31HD15M3X	5	10 (3)	1154	1000	**VW3 A7 705**	11.000

(1) Depends on the drive rating.
(2) Power that can be dissipated by the resistor at the maximum temperature of 115°C, corresponding to a maximum temperature rise of 75°C in a 40°C environment.
(3) Ohmic value obtained as a function of the connection described in the resistor operating instructions.

2

2.3

⊕ **Telemecanique**

Variable speed drives for asynchronous motors
Altivar 31
Options: line chokes

2

2.3

Presentation

Line chokes provide improved protection against overvoltages on the line supply and reduce the current harmonics produced by the drive.

The recommended chokes can be used to limit the line current.
They have been developed in line with standard EN 50178 (VDE 0160 level 1 high energy overvoltages on the line supply).

The inductance values are defined for a voltage drop between 3% and 5% of the nominal line voltage. Values higher than this will cause loss of torque.

The use of line chokes is recommended in particular under the following circumstances:
■ Line supply with significant disturbance from other equipment (interference, overvoltages)
■ Line supply with voltage imbalance between phases > 1.8% of nominal voltage
■ Drive supplied with power by a line with very low impedance (in the vicinity of a power transformer 10 times more powerful than the drive rating)
■ Installation of a large number of frequency inverters on the same line
■ Reduction of overload in cos φ correction capacitors, if the installation has a power factor correction unit

The prospective short-circuit current at the point of connection of the drive must not exceed the maximum value indicated in the reference tables. The use of chokes allows connection to the following line supplies:
- Max. Isc 22 kA for 200/240 V
- Max. Isc 65 kA for 380/500 V and 525/600V

Characteristics

Type of line choke			VZ1 L004 M010	VZ1 L007 UM50	VZ1 L018 UM20	VW3 A4 551	VW3 A4 552	VW3 A4 553	VW3 A4 554	VW3 A4 555
Conformity to standards			EN 50178 (VDE 0160 level 1 high energy overvoltages on the line supply)							
Voltage drop			Between 3% and 5% of the nominal supply voltage. Values higher than this will cause loss of torque.							
Degree of protection	Choke		IP 00							
	Terminals		IP 20						IP 10	
Inductance value		mH	10	5	2	10	4	2	1	0.5
Nominal current		A	4	7	18	4	10	16	30	60
Loss		W	17	20	30	45	65	75	90	80

Telemecanique

Variable speed drives
for asynchronous motors
Altivar 31
Options: line chokes
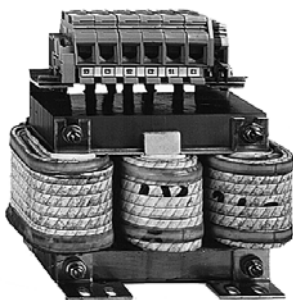
VW3 A 455●

Line chokes

Altivar 31	Line current without choke		Line current with choke		Choke Reference	Weight
	U min. *(1)*	U max. *(1)*	U min. *(1)*	U max. *(1)*		
	A	A	A	A		kg
Single phase supply voltage: 200…240 V 50/60 Hz						
ATV 31H/C/K018M2	3.0	2.5	2.1	1.8	**VZ1 L004M010**	0.630
ATV 31H/C/K037M2	5.3	4.4	3.9	3.3		
ATV 31H/C/K055M2	6.8	5.8	5.2	4.3	**VZ1 L007UM50**	0.880
ATV 31H/C/K075M2	8.9	7.5	7.0	5.9		
ATV 31H/C/KU11M2	12.1	10.2	10.2	8.6	**VZ1 L018UM20**	1.990
ATV 31H/C/KU15M2	15.8	13.3	13.4	11.4		
ATV 31H/C/KU22M2	21.9	18.4	19.2	16.1		
Three phase supply voltage: 200…240 V 50/60 Hz						
ATV 31H018M3X	2.1	1.9	1	0.9	**VW3 A4 551**	1.500
ATV 31H037M3X	3.8	3.3	1.9	1.6		
ATV 31H055M3X	4.9	4.2	2.5	2.2		
ATV 31H075M3X	6.4	5.6	3.3	2.9		
ATV 31HU11M3X	8.5	7.4	4.8	4.2	**VW3 A4 552**	3.000
ATV 31HU15M3X	11.1	9.6	6.4	5.6		
ATV 31HU22M3X	14.9	13	9.2	8	**VW3 A4 553**	3.500
ATV 31HU30M3X	19.1	16.6	12.3	10.7		
ATV 31HU40M3X	24.2	21.1	16.1	14	**VW3 A4 554**	6.000
ATV 31HU55M3X	36.8	32	21.7	19		
ATV 31HU75M3X	46.8	40.9	29	25.2		
ATV 31HD11M3X	63.5	55.6	41.6	36.5	**VW3 A4 555**	11.000
ATV 31HD15M3X	82.1	71.9	55.7	48.6		
Three phase supply voltage: 380…500 V 50/60 Hz						
ATV 31H/C/K037N4	2.2	1.7	1.1	0.9	**VW3 A4 551**	1.500
ATV 31H/C/K055N4	2.8	2.2	1.4	1.2		
ATV 31H/C/K075N4	3.6	2.7	1.8	1.5		
ATV 31H/C/KU11N4	4.9	3.7	2.6	2		
ATV 31H/C/KU15N4	6.4	4.8	3.4	2.6		
ATV 31H/C/KU22N4	8.9	6.7	5	4.1	**VW3 A4 552**	3.000
ATV 31H/C/KU30N4	10.9	8.3	6.5	5.2		
ATV 31H/C/KU40N4	13.9	10.6	8.5	6.6		
ATV 31H/C/KU55N4	21.9	16.5	11.7	9.3	**VW3 A4 553**	3.500
ATV 31H/C/KU75N4	27.7	21	15.4	12.1		
ATV 31H/C/KD11N4	37.2	28.4	22.5	18.1	**VW3 A4 554**	6.000
ATV 31H/C/KD15N4	48.2	36.8	29.6	23.3		
Three phase supply voltage: 525…600 V 50/60 Hz						
ATV 31H075S6X	2.5	2.4	1.4	1.4	**VW3 A4 551**	1.500
ATV 31HU15S6X	4.4	4.2	2.4	2.3		
ATV 31HU22S6X	5.8	5.6	3.8	3.6		
ATV 31HU40S6X	9.7	9.3	6	5.8	**VW3 A4 552**	3.000
ATV 31HU55S6X	14.7	14.1	7.8	7.5		
ATV 31HU75S6X	19.3	18.5	11	10.7	**VW3 A4 553**	3.500
ATV 31HD11S6X	25.4	24.4	15	14.4		
ATV 31HD15S6X	33.2	31.8	21.1	20.6	**VW3 A4 554**	6.000

(1) Nominal supply voltage:

For drives	Nominal voltage	
	U min.	U max.
ATV 31●●●●M2 ATV 31H●●●M3X	200	240
ATV 31●●●●N4	380	500
ATV 31H●●●S6X	525	600

Telemecanique

Variable speed drives
for asynchronous motors
Altivar 31
Options: additional EMC input filters

Presentation

Function

The Altivar 31 has built-in radio interference input filters to meet EMC "product" standards for variable speed drives (IEC/EN 61800-3) and to comply with the European EMC (electromagnetic compatibility) directive.

The additional filters enable the drives to meet more stringent requirements: they are designed to reduce conducted emissions on the line supply below the limits of standards EN 55011 class A or EN 55022 class B (see page 2/121).

These additional filters are mounted underneath ATV 31H drives. They can be mounted on the side of ATV 31C and K drives. They have tapped holes for mounting and act as supports for the drives.

Use according to the type of network

Use of these additional filters is only possible on TN (neutral connection) and TT (neutral to earth) type networks.

Standard IEC 61800-3, appendix D2.1, states that on IT networks (isolated or impedance earthed neutral), filters can cause permanent insulation monitors to operate in a random manner.

In addition, the effectiveness of additional filters on this type of network depends on the type of impedance between neutral and earth, and therefore cannot be predicted.

If a machine is to be installed on an IT network, one solution is to insert an isolation transformer and connect the machine locally on a TN or TT network.

Characteristics

Conformity to standards			EN 133200
Degree of protection			IP 21 and IP 41 on upper part
Maximum relative humidity			93% without condensation or dripping water conforming to IEC 68-2-3
Ambient air temperature around the device	Operation	°C	- 10…+ 60
	Storage	°C	- 25…+ 70
Maximum operating altitude	Without derating	m	1000 (above this, derate the current by 1% per additional 100 m)
Vibration resistance	Conforming to IEC 60068-2-6		1.5 mm peak to peak from 3 to 13 Hz 1 gn peak from 13 to 150 Hz
Shock resistance	Conforming to IEC 60068-2-27		15 gn for 11 ms
Maximum nominal voltage	50/60 Hz single phase	V	240 + 10%
	50/60 Hz three phase	V	240 + 10% 500 + 10%

Telemecanique

Variable speed drives
for asynchronous motors
Altivar 31
Options: additional EMC input filters

VW3 A31405

Additional EMC input filters

For drives	Filter						
Reference	Maximum length of shielded cable *(1)*		In *(2)*	Il *(3)*	Loss *(4)*	Reference	Weight
	EN 55011 Class A	EN 55022 Class B					
	m	m	A	mA	W		kg
Single phase supply voltage: 200…240 V 50/60 Hz							
ATV 31H/C/K018M2 ATV 31H/C/K037M2 ATV 31H/C/K055M2 ATV 31H/C/K075M2	50	20	9	100	3.7	**VW3 A31401**	0.600
ATV 31H/C/KU11M2 ATV 31H/C/KU15M2	50	20	16	150	6.9	**VW3 A31403**	0.775
ATV 31H/C/KU22M2	50	20	22	80	7.5	**VW3 A31405**	1.130
Three phase supply voltage: 200…240 V 50/60 Hz							
ATV 31H018M3X ATV 31H037M3X ATV 31H055M3X ATV 31H075M3X	5	–	7	7	2.6	**VW3 A31402**	0.650
ATV 31HU11M3X ATV 31HU15M3X ATV 31HU22M3X	5	–	15	15	9.9	**VW3 A31404**	1.000
ATV 31HU30M3X ATV 31HU40M3X	5	–	25	35	15.8	**VW3 A31406**	1.650
ATV 31HU55M3X ATV 31HU75M3X	5	–	47	45	19.3	**VW3 A31407**	3.150
ATV 31HD11M3X ATV 31HD15M3X	5	–	83	15	35.2	**VW3 A31408**	5.300
Three phase supply voltage: 380…500 V 50/60 Hz							
ATV 31H/C/K037N4 ATV 31H/C/K055N4 ATV 31H/C/K075N4 ATV 31H/C/KU11N4 ATV 31H/C/KU15N4	50	20	15	15	9.9	**VW3 A31404**	1.000
ATV 31H/C/KU22N4 ATV 31H/C/KU30N4 ATV 31H/C/KU40N4	50	20	25	35	15.8	**VW3 A31406**	1.650
ATV 31H/C/KU55N4 ATV 31H/C/KU75N4	50	20	47	45	19.3	**VW3 A31407**	3.150
ATV 31H/C/KD11N4 ATV 31H/C/KD15N4	50	20	49	45	27.4	**VW3 A31409**	4.750

(1) The filter selection tables give the maximum lengths for shielded cables connecting motors to drives for a switching frequency of 2 to 16 kHz. These limits are given as examples only as they vary depending on the stray capacitance of the motors and the cables used. If motors are connected in parallel, it is the total length that should be taken into account.
(2) In: Nominal filter current.
(3) Il: Maximum earth leakage current at 50 Hz.
(4) Via heat dissipation, at the nominal filter current (In).

2

2.3

Variable speed drives
for asynchronous motors
Altivar 31
Options: Output filters and motor chokes

Presentation

By inserting an output filter between the drive and the motor, it is possible to:
■ Limit the dv/dt at the motor terminals (500 to 1500 V/µs), for cables longer than 50 m
■ Filter interference caused by opening a contactor placed between the filter and the motor
■ Reduce the motor earth leakage current

When using a downstream contactor between the drive and the motor, ferrite suppressors should be attached to each motor cable for certain drive ratings supplied with a single phase or 3-phase 200 V supply.

2

2.3

Description

LR filter cell
This cell comprises 3 high frequency chokes and 3 resistors.
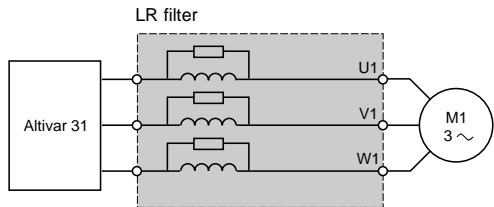
LC filter cell
This cell comprises 3 high frequency chokes and 3 capacitors.
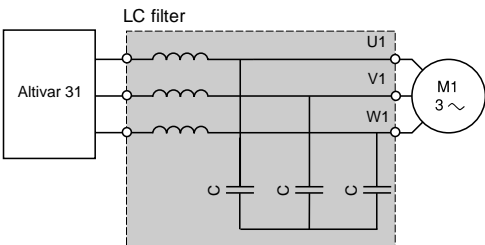
Motor choke
For standard motor cables longer than 100 m (50 m for shielded cables), a choke can be used to limit overvoltages at the motor terminals.
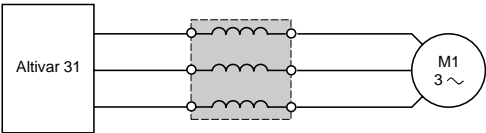
Ferrite suppressor for downstream contactor opening
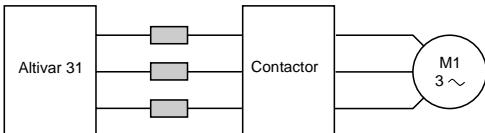
Characteristics *(1)*

		LR filter cells *(2)*	LC filter cells		Motor chokes	
		VW3 A5845●	VW3 A66412		VW3 A4 552 …A4 555	VW3 A4 556
Drive switching frequency	kHz	0.5…4 Max.	2 or 4	12	4	
Length of motor cable	Shielded cables	m	≤ 100	≤ 100	≤ 50	≤ 100	
	Unshielded cables	m	–	≤ 200	≤ 100	–	
Degree of protection			IP 20	IP 00	IP 00	IP 20	IP 00

(1) Filter performance is ensured if the cable lengths between the motor and the drive given in the table above are not exceeded.
For an application with several motors connected in parallel, the cable length must include all tap-offs. If a cable longer than that recommended is used, the filters may overheat.
(2) For frequencies greater than 4 kHz or cable lengths longer than 100 metres, please consult your Regional Sales Office.

Ⓔ **Telemecanique**

Variable speed drives
for asynchronous motors

Altivar 31
Options: Output filters and motor chokes
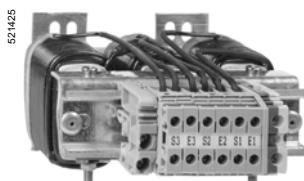
VW3 A58451

LR filter cells

For drives	Loss	Nominal current	Reference	Weight
	W	**A**		**kg**
ATV 31H/C/K018M2 ATV 31H/C/K037M2 ATV 31H/C/K055M2 ATV 31H/C/K075M2 ATV 31H/C/KU11M2 ATV 31H/C/KU15M2 ATV 31H018M3X ATV 31H037M3X ATV 31H055M3X ATV 31H075M3X ATV 31HU11M3X ATV 31HU15M3X ATV 31H/C/K037N4 ATV 31H/C/K055N4 ATV 31H/C/K075N4 ATV 31H/C/KU11N4 ATV 31H/C/KU15N4 ATV 31H/C/KU22N4 ATV 31H/C/KU30N4 ATV 31H/C/KU40N4 ATV 31H/C/KD11N4 ATV 31H/C/KD15N4 ATV 31H075S6X ATV 31HU15S6X, ATV 31HU22S6X ATV 31HU40S6X, ATV 31HU55S6X	150	10	**VW3 A58451**	7.400
ATV 31H/C/KU22M2 ATV 31HU22M3X, ATV 31HU30M3X ATV 31H/C/KU55N4 ATV 31HU75S6X	180	16	**VW3 A58452**	7.400
ATV 31HU40M3X…HU75M3X ATV 31H/C/KU75N4 ATV 31HD11S6X, ATV 31HD15S6X	220	33	**VW3 A58453**	12.500

LC filter cells

For drives			Reference	Weight kg
ATV 31HD11M3X ATV 31HD15M3X			**VW3 A66412**	3.500

Motor chokes

For drives	Loss	Nominal current	Reference	Weight
	W	**A**		**kg**
ATV 31H/C/KU22N4 ATV 31H/C/KU30N4 ATV 31H/C/KU40N4 ATV 31HU40S6X, ATV 31HU55S6X	65	10	**VW3 A4 552**	3.000
ATV 31H/C/KU22M2, ATV 31HU22M3X ATV 31HU30M3X, ATV 31H/C/KU55N4 ATV 31HU75S6X	75	16	**VW3 A4 553**	3.500
ATV 31HU40M3X…HU75M3X ATV 31H/C/KU75N4 ATV 31H/C/KD11N4 ATV 31HD11S6X ATV 31HD15S6X	90	30	**VW3 A4 554**	6.000
ATV 31H/C/KD15N4	80	60	**VW3 A4 555**	11.000
ATV 31HD11M3X ATV 31HD15M3X	–	100	**VW3 A4 556**	16.000

Ferrite suppressors for downstream contactor opening

For drives	Sold in lots of	Unit reference	Weight kg
ATV 31H018M2 ATV 31H037N4	3	**VW3 A31451**	–
ATV 31H037M2 ATV 31H018M3X, ATV 31H037M3X ATV 31H055N4, ATV 31H075N4	3	**VW3 A31452**	–
ATV 31H055M2, ATV 31H075M2 ATV 31HU11M2…HU22M2 ATV 31H055M3X…ATV 31HU22M3X ATV 31HU11N4…HU22N4	3	**VW3 A31453**	–

Ⓣ **Telemecanique**

Variable speed drives
for asynchronous motors
Altivar 31
Communication options

2

2.3

Modbus and CANopen communication buses

The Altivar 31 can connect directly to Modbus and CANopen buses by means of an RJ45 connector, which supports both protocols.
The communication function provides access to the drive's configuration, adjustment, control and monitoring functions.

CANopen

ATV 31
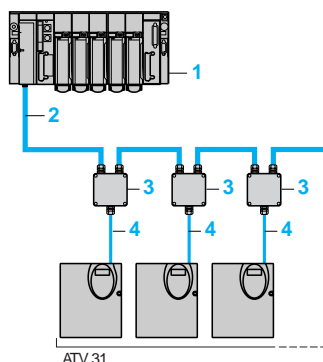
1 PLC *(1)*
2 CANopen trunk cable
3 CANopen tap junctions **VW3 CAN TAP2**
4 CANopen drop cables **VW3 CAN CA RR●●**

Modbus

Connection via splitter boxes and RJ45 connectors

ATV 31
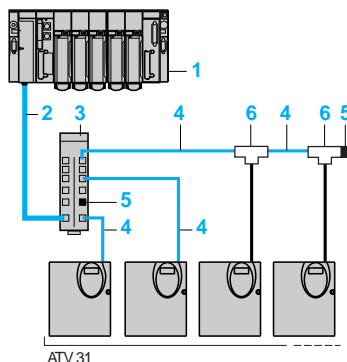
1 PLC *(1)*
2 Modbus cable (depending on the type of controller or PLC)
3 Modbus splitter block **LU9 GC3**
4 Modbus drop cables **VW3 A8 306 R●●**
5 Line terminators
   VW3 A8 306 RC
6 Modbus T-junction boxes
   VW3 A8 306 TF●● (with cable)

Connection via junction boxes

ATV 31
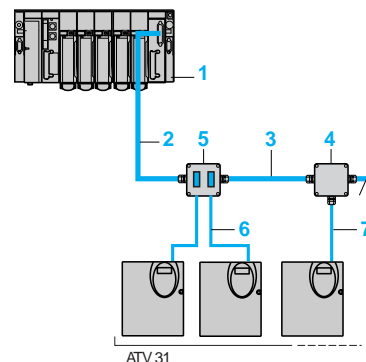
1 PLC *(1)*
2 Modbus cable (depending on the type of controller or PLC)
3 Modbus cable **TSX CSA●00**
4 T-junction box **TSX SCA 50**
5 Subscriber socket **TSX SCA 62**
6 Modbus drop cable **VW3 A8 306**
7 Modbus drop cable **VW3 A8 306 D30**

Connection via screw terminals
Use a Modbus drop cable **VW3 A8 306 D30** and line terminators **VW3 A8 306 DRC**.

Other communication buses

The Altivar 31 can also connect to the following networks via a module (bridge or gateway):
■ Ethernet
■ Fipio
■ Profibus DP
■ DeviceNet
The communication function provides access to the drive's configuration, adjustment, control and monitoring functions.

ATV 31
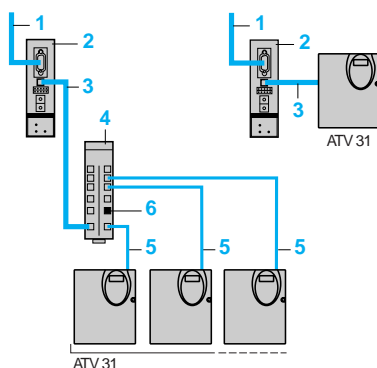
1 To network
2 Communication modules
3 **VW3 A8 306 R●●**, **VW3 P07 306 R10**
   or **VW3 A8 306 D30** cables, depending
   on the type of module
4 Modbus splitter block **LU9 GC3**
5 Modbus drop cables **VW3 A8 306 R●●**
6 Line terminator **VW3 A8 306 RC**

(1) Please consult the specialist "Automation platform Modicon Premium and Unity - PL7 software" and "Automation platform Modicon TSX Micro and PL7 software" catalogues.

⊕ **Telemecanique**

Variable speed drives
for asynchronous motors
Altivar 31
Communication options
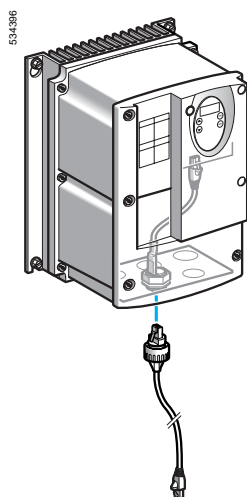
Modbus and CANopen communication buses

Connection accessories

Description			Unit reference	Weight kg
Tap junction for CANopen bus			**VW3 CAN TAP2**	–
Modbus junction box 3 screw terminals, RC line terminator To be connected using cable VW3 A8 306 D30			**TSX SCA 50**	0.520
Modbus subscriber socket 2 female 15-way SUB-D connectors and 2 screw terminals, RC line terminator To be connected using cable VW3 A8 306			**TSX SCA 62**	0.570
Modbus splitter block 10 RJ45 connectors and 1 screw terminal block			**LU9 GC3**	0.500
Modbus line terminators *(1) (2)*	For RJ45 connector	R = 120 Ω, C = 1 nf	**VW3 A8 306 RC**	0.200
		R = 150 Ω	**VW3 A8 306 R**	0.200
	For screw terminals	R = 120 Ω, C = 1 nf	**VW3 A8 306 DRC**	0.200
		R = 150 Ω	**VW3 A8 306 DR**	0.200
Modbus T-junction boxes		With integrated cable (0.3 m)	**VW3 A8 306 TF03**	–
		With integrated cable (1 m)	**VW3 A8 306 TF10**	–

Connection cables

Description	Length m	Connectors	Reference	Weight kg
Cables for CANopen bus	0.3	2 RJ45 connectors	**VW3 CAN CA RR03**	0.050
	1	2 RJ45 connectors	**VW3 CAN CA RR1**	0.500
Cables for Modbus bus	3	1 RJ45 connector and one stripped end	**VW3 A8 306 D30**	0.150
	3	1 RJ45 connector and 1 male 15-way SUB-D connector for TSX SCA 62	**VW3 A8 306**	0.150
	0.3	2 RJ45 connectors	**VW3 A8 306 R03**	0.050
	1	2 RJ45 connectors	**VW3 A8 306 R10**	0.050
	3	2 RJ45 connectors	**VW3 A8 306 R30**	0.150
Internal IP 55 cable for Modbus bus For the remote location of the drive's RJ45 port on the enclosure to maintain IP 55 protection	0.3	1 RJ45 connector and 1 IP 55 RJ45 connection base	**VW3 A0 1500**	0.050
IP 55 cable for Modbus bus For connecting an enclosed drive equipped with a VW3 A0 1500 cable	3	1 RJ45 connector 1 IP 55 RJ45 connector	**VW3 A0 1501**	0.130
Cables for Profibus DP gateway LA9 P307	1	2 RJ45 connectors	**VW3 P07 306 R10**	0.050
RS 485 double shielded twisted pair Modbus cables	100	Supplied without connector	**TSX CSA 100**	–
	200	Supplied without connector	**TSX CSA 200**	–
	500	Supplied without connector	**TSX CSA 500**	–

Other communication buses

Description	Cables to be connected	Reference	Weight kg
Ethernet/Modbus bridge with 1 x Ethernet 10baseT port (RJ45 type)	VW3 A8 306 D30	**174 CEV 300 20** *(3)*	0.500
Fipio/Modbus gateway *(4)*	VW3 A8 306 R●●	**LUF P1**	0.240
DeviceNet/Modbus gateway *(4)*	VW3 A8 306 R●●	**LUF P9**	0.240
Profibus DP/Modbus gateway Parameters set using standard Profibus DP configurator *(5)*	VW3 P07 306 R10	**LA9 P307**	0.240
Profibus DP/Modbus gateway Parameters set using ABC Configurator software *(4)*	VW3 A8 306 R●●	**LUF P7**	0.240

(1) Depends on the bus architecture (see page 4/12).
(2) Sold in lots of 2.
(3) Please consult the specialist "Automation platform Modicon Premium and Unity - PL7 software" catalogue.
(4) See pages 4/22 and 4/23.
(5) See pages 4/24 and 4/25.

TSX SCA 50

TSX SCA 62

VW3 A0 1500
+
VW3 A0 1501

LUF P1   *LA9 P307*

2

2.3

Variable speed drives
for asynchronous motors
Altivar 31
Drives with heatsink

ATV 31H0●●M2/M2A, ATV 31H0●●M3X/M3XA

Plate for EMC mounting (supplied with the drive)
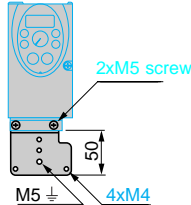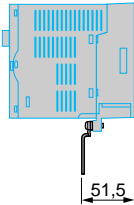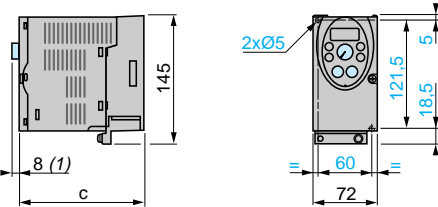
ATV31H	c
018M3X, 037M3X	120
055M3X, 075M3X	130
018M2, 037M2	140
055M2, 075M2	145

*(1) Only for drives whose reference ends in **A**.*

ATV 31HU●●M2/M2A, ATV 31HU11M3X/M3XA to ATV 31HU40M3X/M3XA, ATV 31H037N4/N4A to ATV 31HU40N4/N4A, ATV 31H075S6X to ATV 31HU40S6X

Plate for EMC mounting (supplied with the drive)
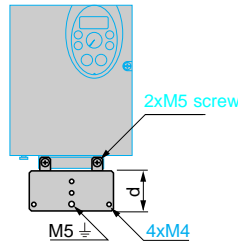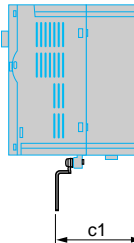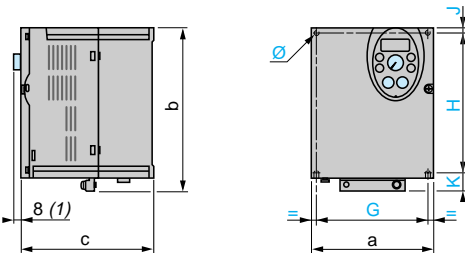
ATV 31H	a	b	c	c1	d	G	H	J	K	Ø
U1●M3X	105	143	130	67.3	49	93	121.5	5	16.5	2x5
U1●M2, U22M3X 037N4 to U15N4 075S6X, U15S6X	107	143	150	67.3	49	93	121.5	5	16.5	2x5
U22M2, HU●0M3X U22N4 to U40N4 U22S6X, U40S6X	142	184	150	88.8	48	126	157	6.5	20.5	4x5

*(1) Only for drives whose reference ends in **A**.*

Variable speed drives
for asynchronous motors
Altivar 31
Drives with heatsink, enclosed drives

ATV 31HU55M3X/M3XA, ATV 31HU75M3X/M3XA, ATV 31HU55N4/N4A, ATV 31HU75N4/N4A, ATV 31HU55S6X, ATV 31HU75S6X

Plate for EMC mounting (supplied with the drive)
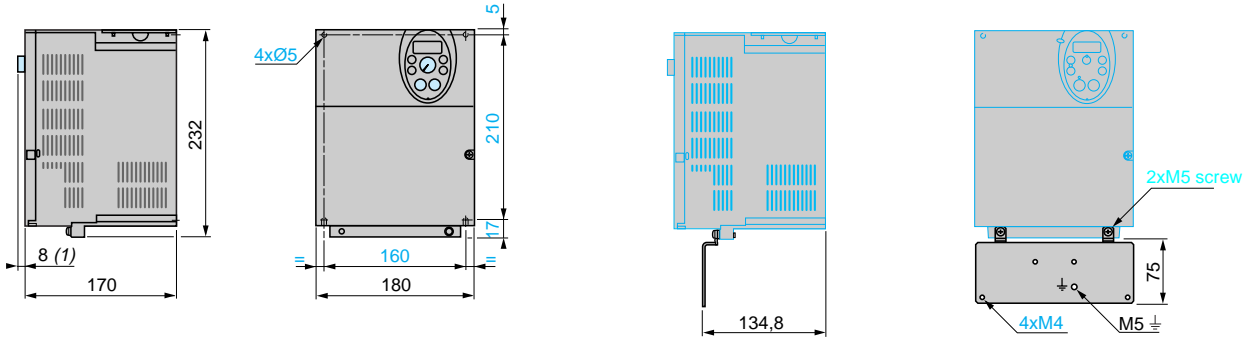
*(1) Only for drives whose reference ends in **A**.*

ATV 31HD1●M3X/M3XA, ATV 31HD1●N4/N4A, ATV 31HD1●S6X

Plate for EMC mounting (supplied with the drive)
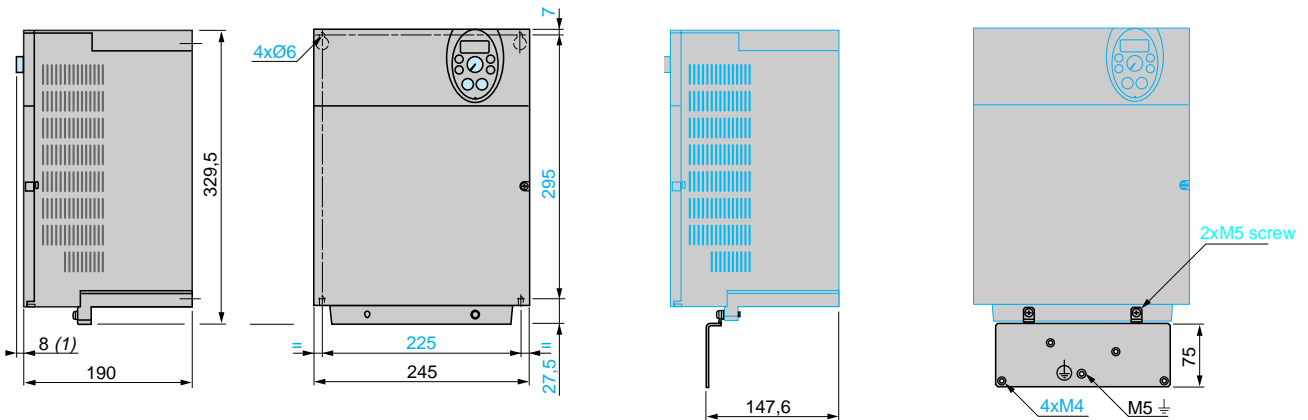
*(1) Only for drives whose reference ends in **A**.*

ATV 31C●●●M2, ATV 31C037N4 to ATV 31CU40N4

ATV 31CU55N4 to ATV 31CD15N4
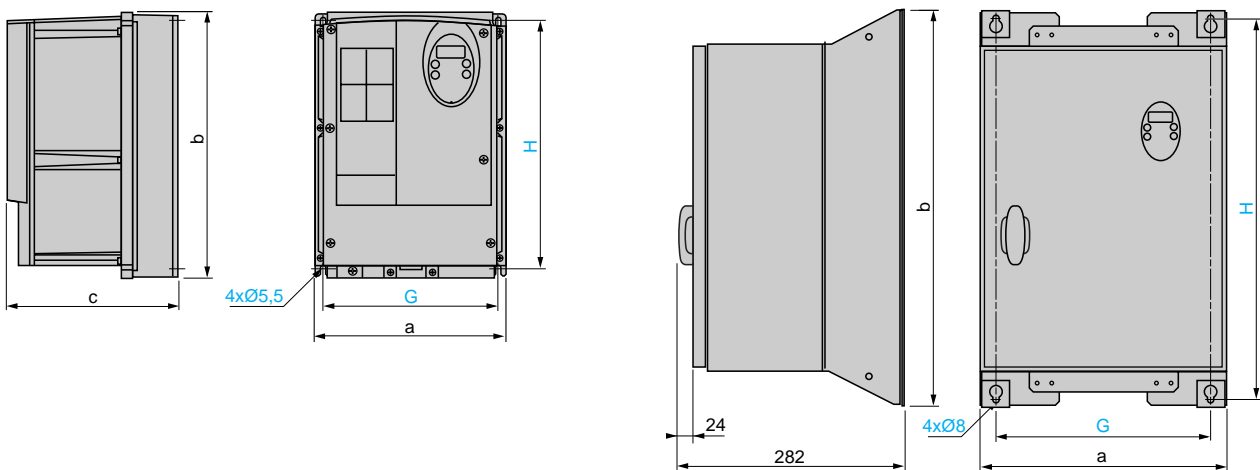
ATV 31C	a	b	c	G	H
0●●M2	210	240	163	192	218
U11M2, U15M2, 0●●N4,U11N4, U15N4	215	297	192	197	277
U22M2, U22N4…U40N4	230	340	208	212	318

ATV 31C	a	b	G	H
U55N4, U75N4	320	512	279	480
D11N4, D15N4	440	625	399	594

Variable speed drives
for asynchronous motors
Altivar 31
Drive kits

ATV 31K018M2 to KU22M2, ATV 31K037N4 to KU40N4

Cut-outs and drill holes
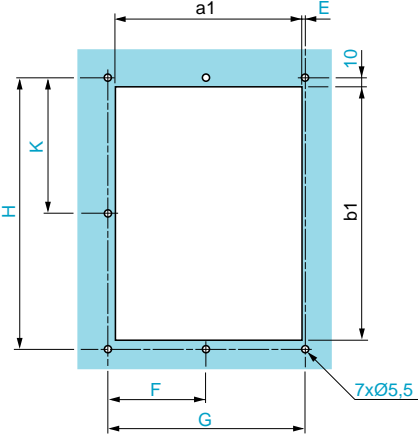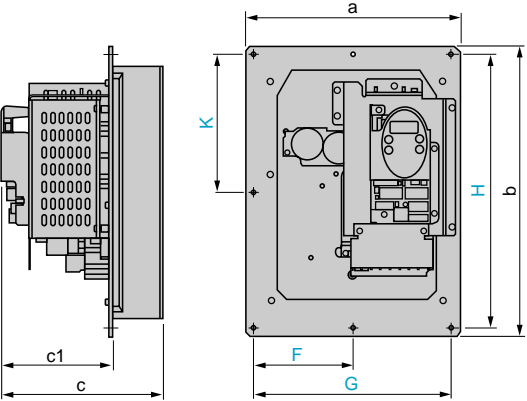
ATV 31K	a	a1	b	b1	c	c1	E	F	G	H	K
018M2…075M2	254	214	280	240	153	123	10	117	234	260	130
U11M2, U15M2, 037N4…U15N4	250	219	337	297	186	127	1	115	230	317	158.5
U22M2, U22N4…U40N4	265	234	380	340	209	134	1	122.5	245	360	180

Note: product supplied with drilling template.

ATV 31KU55N4 to ATV 31KD15N4

Cut-outs and drill holes
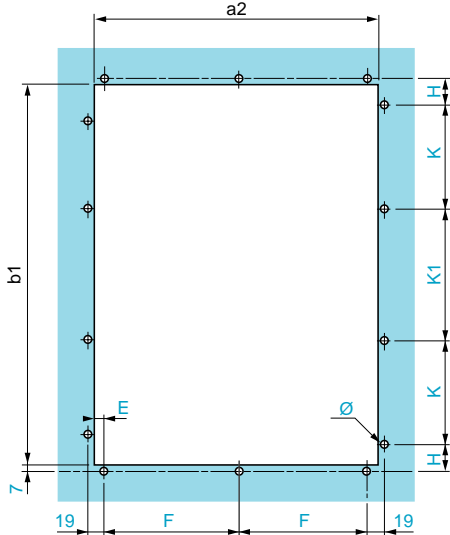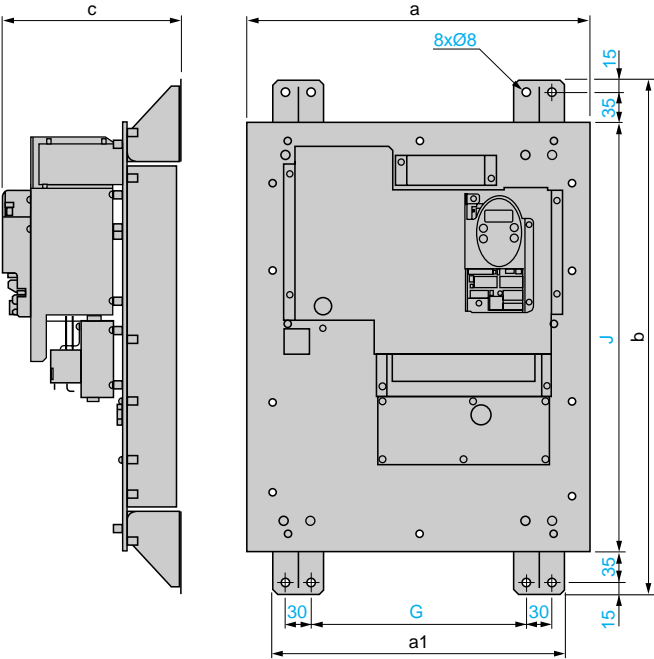
ATV 31K	a	a1	a2	b	b1	c	E	F	G	H	J	K	K1	Ø
U55N4, U75N4	400	340	334	600	444	243	12	155	250	49	500	180	0	12 x 6
D11N4, D15N4	450	370	386	700	546	267	13	180	280	39	600	150	180	14 x 6

Note: product supplied with drilling template.

Variable speed drives
for asynchronous motors
Altivar 31
Accessories and braking resistors

Plates for mounting on ⌐ rail

VW3 A11851
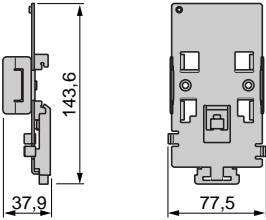
VW3 A31852
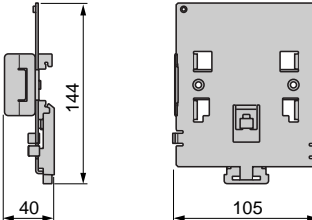
UL Type 1 conformity kits

VW3 A31811 to VW3 A31817
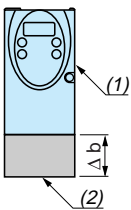
VW3	Δ b
A31811 to A31815	68
A31816	96
A31817	99

(1) Drive
(2) VW3 A3181● kit

Remote terminal

VW3 A31101

Cut-outs and drill holes
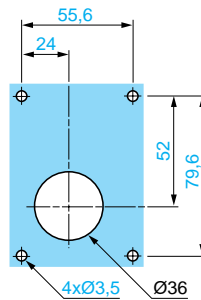
Bare braking resistors

VW3 A58702 and VW3 A58704

2-wire output, length 0.5 m
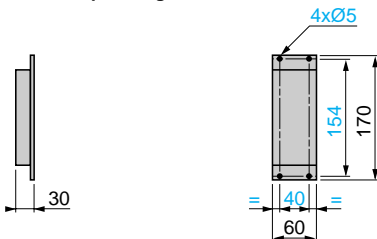
VW3 A58703

2-wire output, length 0.5 m
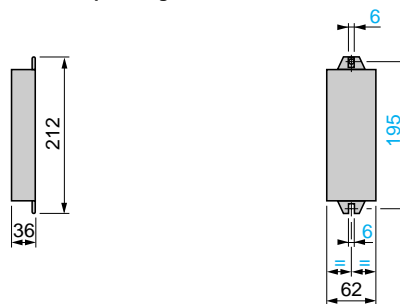
Protected braking resistors

VW3 A7 701 à VW3 A7 703

Mounting recommendations
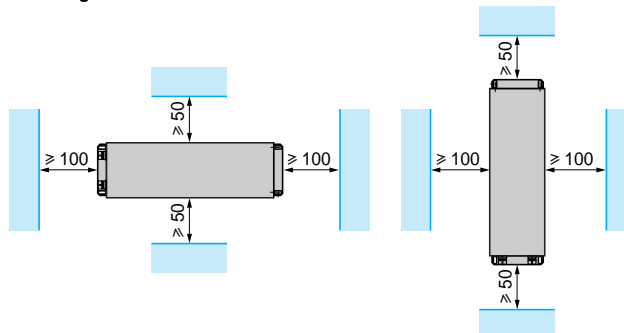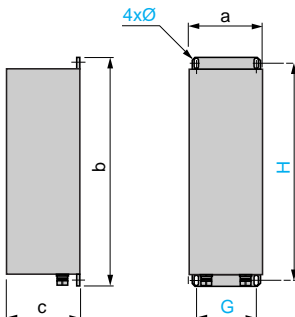
VW3	a	b	c	G	H	Ø
A7 701	95	293	95	70	275	6 x 12
A7 702	95	293	95	70	375	6 x 12
A7 703	140	393	120	120	375	6 x 12

Telemecanique

Variable speed drives
for asynchronous motors
Altivar 31
Braking resistors and chokes

Protected braking resistors (continued)
VW3 A7 704 et VW3 A7 705

Mounting recommendations
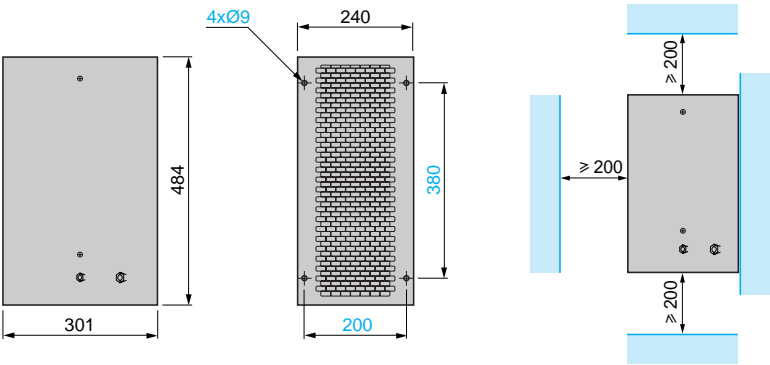
Line chokes
VZ1 L●●●●●●●
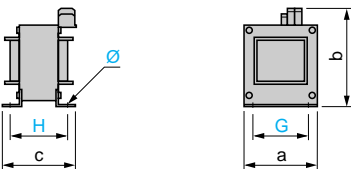
VZ1	a	b	c	G	H	Ø
L004M010	60	100	80	50	44	4 x 9
L007UM50	60	100	95	50	60	4 x 9
L018UM20	85	120	105	70	70	5 x 11

Line chokes and motor chokes

VW3 A4 551 to VW3 A4 555

VW3 A4 556
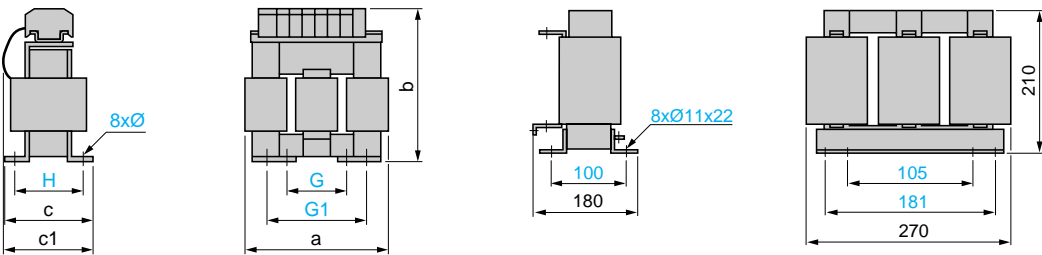
VW3	a	b	c	c1	G	G1	H	Ø
A4 551	100	135	55	60	40	60	42	6 x 9
A4 552 and A4 553	130	155	85	90	60	80.5	62	6 x 12
A4 554	155	170	115	135	75	107	90	6 x 12
A4 555	180	210	125	165	85	122	105	6 x 12

Telemecanique

Variable speed drives
for asynchronous motors
Altivar 31
EMC filters and output filters

Additional EMC input filters

| Mounting the filter under the drive | | | | Mounting the filter next to the drive | | |
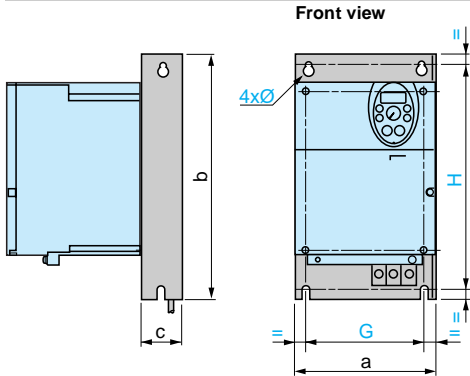
Front view
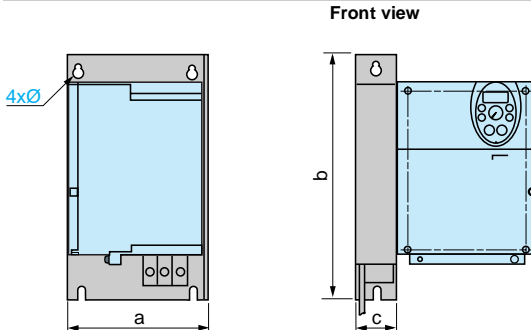
VW3	a	b	c	G	H	Ø
A31401, A31402	72	195	37	52	180	4.5
A31403	107	195	35	85	180	4.5
A31404	107	195	42	85	180	4.5
A31405	140	235	35	120	215	4.5
A31406	140	235	50	120	215	4.5
A31407	180	305	60	140	285	5.5
A31408	245	395	80	205	375	5.5
A31409	245	395	60	205	375	5.5

LR filter cells
VW3 A58451 to VW3 A58453
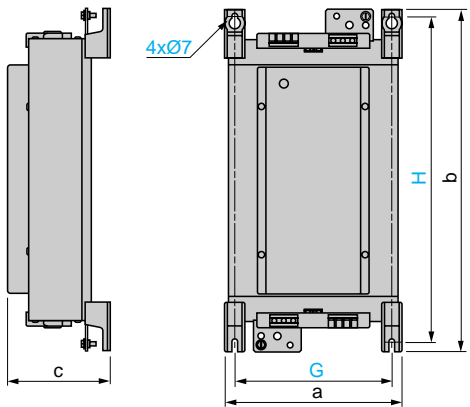
LC filter cell
VW3 A66412
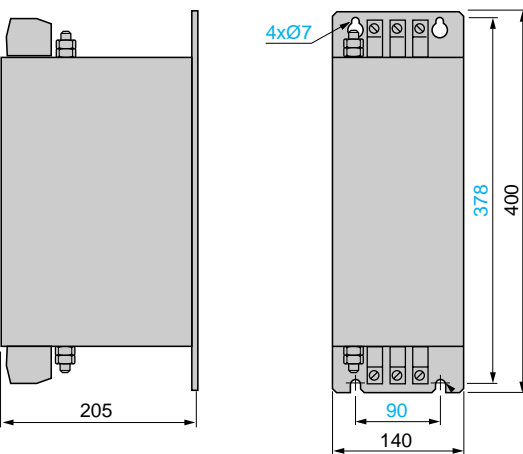
VW3	a	b	c	G	H
A58451 A58452	169.5	340	123	150	315
A58453	239	467.5	139.5	212	444

Ferrite suppressors for downstream contactor opening
VW3 A31451 to VW3 A31453
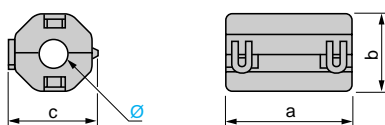
VW3	a	b	c	Ø
A31451	33.5	33	33	13
A31452	33	21.5	22.5	9
A31453	30	19	19	6

Variable speed drives
for asynchronous motors
Altivar 31

2

2.3

ATV 31●●●●M2
Single phase power supply
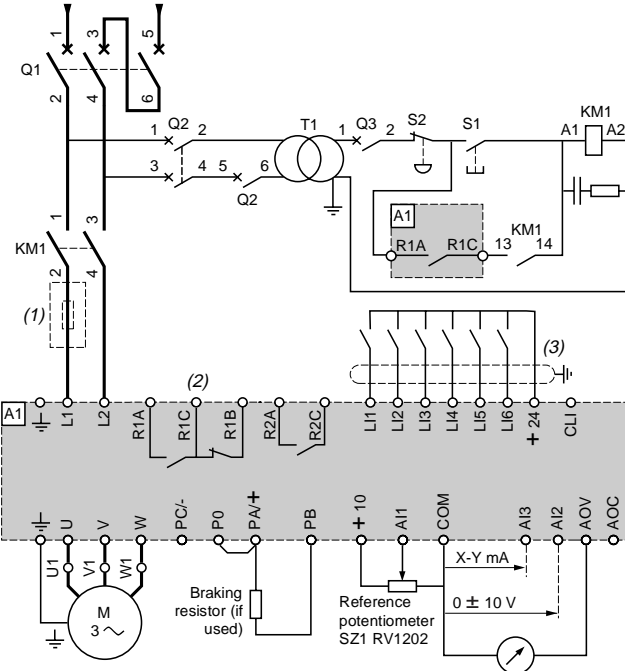
ATV 31●●●●M3X, ATV 31●●●●N4, ATV 31●●●●S6X
Three phase power supply
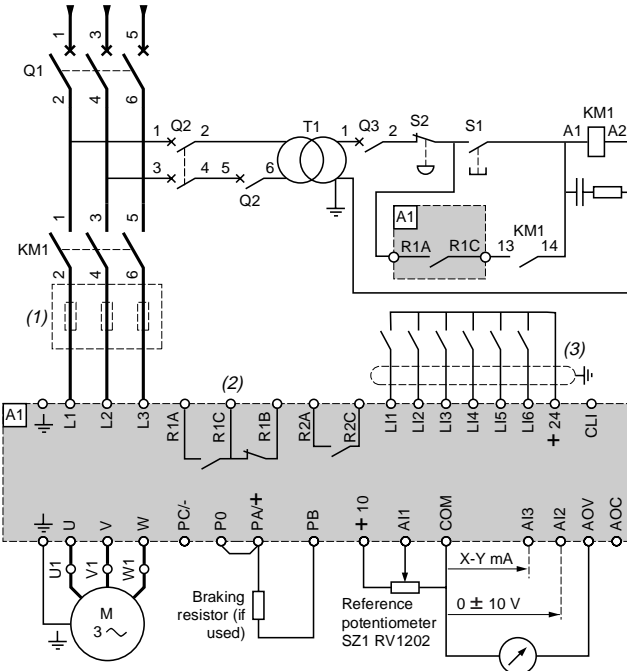
(1) Line choke (single phase or three phase)
(2) Fault relay contacts for remote signalling of the drive status
(3) Connection of the common for the logic inputs depends on the position of the switch (see diagrams below).
Note: All terminals are located at the bottom of the drive.
Install interference suppressors on all inductive circuits near the drive or connected on the same circuit, such as relays, contactors, solenoid valves, fluorescent lighting, etc.

Compatible components (for a complete list of references, please consult the specialist catalogue "Motor starter solutions. Control and protection components").

Ref.	Description
Q1	GV2 L or Compact NS (see pages 2/136 to 2/139)
KM1	LC1 ●●● + LA4 DA2U (see pages 2/136 to 2/139)
S1, S2	XB2 B or XA2 B pushbuttons
T1	100 VA transformer 220 V secondary
Q2	GV2 L rated at twice the nominal primary current of T1
Q3	GB2 CB05

Examples of recommended circuit diagrams

Logic input switches
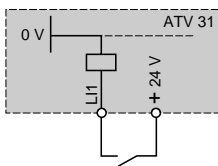
Source position	Sink position	CLI position with PLC transistor outputs
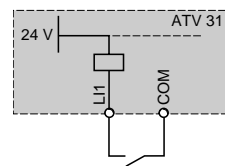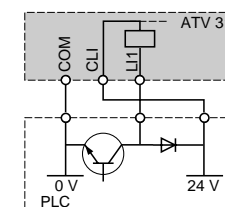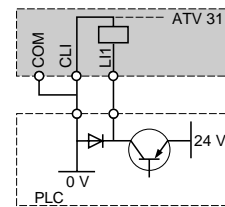
AOC output

Wired as logic output
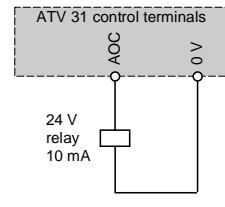
2-wire control
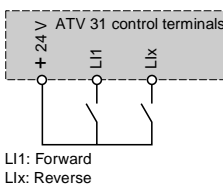
LI1: Forward
LIx: Reverse

3-wire control
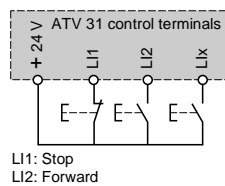
LI1: Stop
LI2: Forward
LIx: Reverse
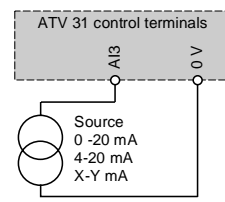
Analog voltage inputs

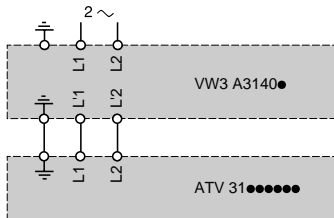+ 10 V external
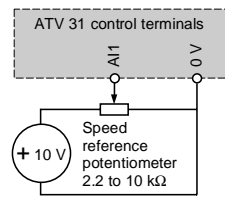
± 10 V external
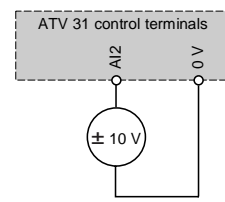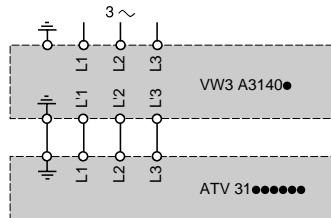

Analog current input

0-20 mA, 4-20 mA, X-Y mA

Source
0 -20 mA
4-20 mA
X-Y mA

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Variable speed drives
for asynchronous motors
Altivar 31

Schemes

A3140● additional EMC input filters

Single phase power supply

VW3 A3140●

ATV 31●●●●●●

Three phase power supply


VW3 A3140●

ATV 31●●●●●●

Connections to meet the requirements of EMC standards

Principle

■ Earths between the drive, motor and cable shielding must have "high frequency" equipotentiality.
■ Use shielded cables with the shielding connected to earth throughout 360° at both ends for the motor cable, the braking resistor cable and the control-signalling cables. Metal ducting or conduit can be used for part of the shielding length provided that there is no break in continuity.
■ Ensure maximum separation between the power supply cable (line supply) and the motor cable.

Installation diagram for ATV 31H●●● drives
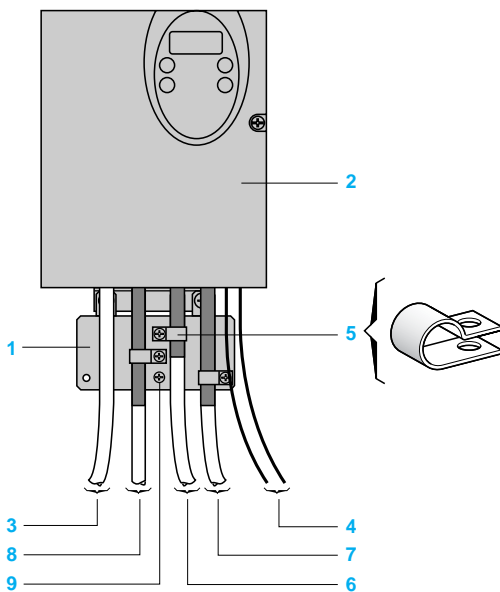
1 Steel plate supplied with the drive, to be mounted on it (earthed casing)
2 Altivar 31
3 Unshielded power supply wire or cable
4 Unshielded wires for the output of the safety relay contacts.
5 Attach and earth the shielding of cables **6**, **7** and **8** as close as possible to the drive:
- Strip the shielding.
- Use cable clamps of an appropriate size on the parts from which the shielding has been stripped, to attach them to the steel plate **1**.
The shielding must be clamped tightly enough to the steel plate to ensure good contact.
Cable clamps must be made from stainless steel.
6 Shielded cable for connecting the motor
7 Shielded cable for connecting the control/signal wiring. For applications requiring several conductors, use cables with a small cross-section (0.5 mm²).
8 Shielded cable for connecting the braking resistor
9 Earthing screw for the motor cable with low ratings, as the screw on the heatsink is inaccessible.

6, **7**, **8** The shielding must be earthed at both ends. The shielding must be continuous and any intermediate terminals must be in EMC shielded metal boxes.

Note: The HF equipotential earth connection between the drive, motor and cable shielding does not remove the need to connect the PE conductors (green-yellow) to the appropriate terminals on each unit.
*If using an additional input filter, it should be mounted beneath the drive and connected directly to the line supply via an unshielded cable. Link **3** on the drive is then via the filter output cable.*

Operation on an IT system

IT system: Isolated or impedance earthed neutral
Use a permanent insulation monitor compatible with non-linear loads, such as a Merlin Gerin type XM200 (please consult your Regional Sales Office).

ATV 31●●●●M2 and N4 drives have built-in EMC filters. There are two ways of isolating these filters from earth for operation on an IT system depending on the rating:
■ ATV 31H018M2 to ATV 31HU22M2 and ATV 31H037N4 to ATV 31HU40N4, remove a jumper to disconnect the filter
■ ATV 31HU55N4 to ATV 31HD15N4, move the wire with the cable tag to disconnect the filter

Variable speed drives for asynchronous motors
Altivar 31

2

2.3
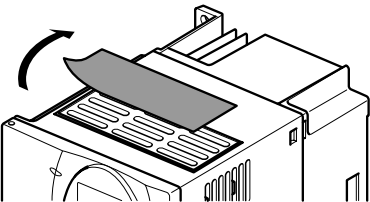
Depending on the conditions in which the drive is to be used, its installation will require certain precautions and the use of appropriate accessories.
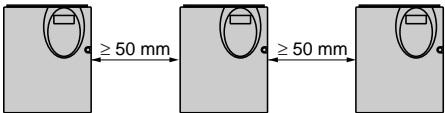
Mounting recommendations for ATV 31H drives

■ Install the unit vertically, at ± 10°.
■ Do not place it close to heating elements.
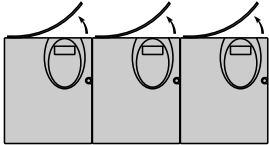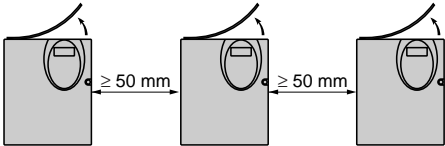■ Leave sufficient free space to ensure that the air required for cooling purposes can circulate from the bottom to the top of the unit.

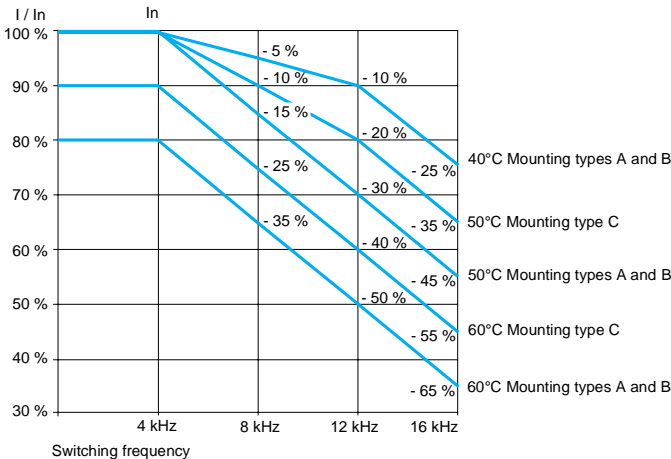## Mounting types

■ **Type A mounting**

■ **Type B mounting**

■ **Type C mounting**



Removing the protective cover

Removing the protective cover from the top of the drive (as shown opposite) changes the degree of protection to IP 20.

Derating curves for the nominal drive current (In) as a function of temperature, switching frequency and mounting type.

For intermediate temperatures (55°C for example), interpolate between 2 curves.

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Variable speed drives for asynchronous motors
Altivar 31
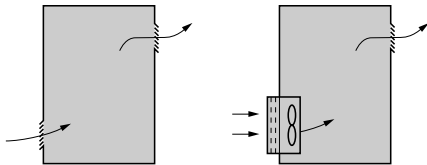
Specific recommendations for mounting ATV 31 drives in a wall-mounted or floor-standing enclosure

Follow the mounting recommendations on the opposite page.
To ensure proper air circulation in the drive:
■ Fit ventilation grilles
■ Ensure that there is sufficient ventilation. If there is not, install a forced ventilation unit with a filter. The openings and/or fans must provide a flow rate at least equal to that of the drive fans (see the table below)
■ Use special filters with IP 54 protection
■ Remove the protective cover from the top of the drive

Fan flow rate depending on the drive rating

ATV 31	Flow rate m³/min
H018M2, H037M2, H055M2, H018M3X, H037M3X, H055M3X, H037N4, H055N4, H075N4, HU11N4, H075S6X, HU15N6X	0.3
H075M2, HU11M2, HU15M2, H075M3X, HU11M3X, HU15M3X, HU15N4, HU22N4, HU22S6X, HU40N6X	0.55
HU22M2, HU22M3X, HU30M3X, HU40M3X, HU30N4, HU40N4, HU55S6X, HU75S6X	1.55
HU55M3X, HU55N4, HU75N4, HD11S6X	1.7
HU75M3X, HD11M3X, HD11N4, HD15N4, HD15S6X	2.8
HD15M3X	3.6

Metal wall-mounted or floor-standing enclosure (IP 54 degree of protection)

The drive must be mounted in a dust and damp proof enclosure in certain environmental conditions: dust, corrosive gases, high humidity with risk of condensation and dripping water, splashing liquid, etc.
This enables the drive to be used in an enclosure where the maximum internal temperature can reach 50°C.

Calculating the size of the enclosure

Maximum thermal resistance Rth (°C/W)

$$Rth = \frac{\theta° - \theta e}{P}$$

θ = maximum temperature inside enclosure in °C
θe = maximum external temperature in °C
P = total power dissipated in the enclosure in W

Power dissipated by drive: see page 2/112.
Add the power dissipated by the other equipment components.

Useful heat exchange surface area of enclosure S (m²)

(sides + top + front panel if wall-mounted)

$$S = \frac{K}{Rth}$$

K = thermal resistance per m² of the enclosure

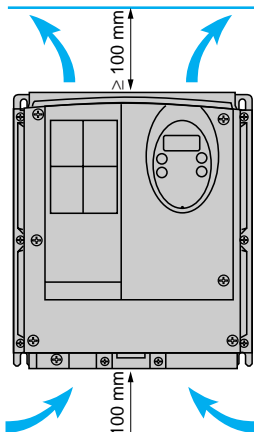For metal enclosures: K = 0.12 with internal fan, K = 0.15 without fan

Note: *Do not use insulated enclosures as they have a poor level of conductivity.*

Mounting recommendations for ATV 31 enclosed drives

Install the unit vertically, at ± 10°.
Do not place it close to heating elements.
Leave sufficient free space to ensure that the air required for cooling purposes can circulate from the bottom to the top of the unit.

Variable speed drives
for asynchronous motors
Altivar 31
Motor starters

GV2 L
+
LC1 K
+
ATV 31H●●●●●●

Applications

The combinations listed below can be used to assemble a complete motor starter comprising a circuit-breaker, a contactor and an Altivar 31 variable speed drive.
The circuit-breaker provides protection against accidental short-circuits, isolation and padlocking, if required.
The contactor controls and manages any safety features and isolates the motor on stopping.
The Altivar 31 drive is protected electronically against short-circuits between phases and between phase and earth; it therefore ensures continuity of service and thermal protection of the motor.

Motor starter for ATV 31H drive

Variable speed drive Reference	Standard power rating of 4-pole motors 50/60 Hz (1)		Circuit-breaker (2)		Max. prosp. line Isc	Contactor (3) Add the voltage reference to the basic reference to obtain the full reference (4)
			Reference	Rating		
	kW	HP		A	kA	
Single phase supply voltage: 200…240 V						
ATV 31H018M2	0.18	0.25	**GV2 L08**	4	1	**LC1 K0610●●**
ATV 31H037M2	0.37	0.5	**GV2 L10**	6.3	1	**LC1 K0610●●**
ATV 31H055M2	0.55	0.75	**GV2 L14**	10	1	**LC1 K0610●●**
ATV 31H075M2	0.75	1	**GV2 L14**	10	1	**LC1 K0610●●**
ATV 31HU11M2	1.1	1.5	**GV2 L16**	14	1	**LC1 K0610●●**
ATV 31HU15M2	1.5	2	**GV2 L20**	18	1	**LC1 K0610●●**
ATV 31HU22M2	2.2	3	**GV2 L22**	25	1	**LC1 D09●●**
Three phase supply voltage: 200…240 V						
ATV 31H018M3X	0.18	0.25	**GV2 L07**	2.5	5	**LC1 K0610●●**
ATV 31H037M3X	0.37	0.5	**GV2 L08**	4	5	**LC1 K0610●●**
ATV 31H055M3X	0.55	0.75	**GV2 L10**	6.3	5	**LC1 K0610●●**
ATV 31H075M3X	0.75	1	**GV2 L14**	10	5	**LC1 K0610●●**
ATV 31HU11M3X	1.1	1.5	**GV2 L14**	10	5	**LC1 K0610●●**
ATV 31HU15M3X	1.5	2	**GV2 L16**	14	5	**LC1 K0610●●**
ATV 31HU22M3X	2.2	3	**GV2 L20**	18	5	**LC1 K0610●●**
ATV 31HU30M3X	3	–	**GV2 L22**	25	5	**LC1 D09●●**
ATV 31HU40M3X	4	5	**GV2 L22**	25	5	**LC1 D09●●**
ATV 31HU55M3X	5.5	7.5	**NS80HMA**	50	22	**LC1 D32●●**
ATV 31HU75M3X	7.5	10	**NS80HMA**	50	22	**LC1 D32●●**
ATV 31HD11M3X	11	15	**NS80HMA**	80	22	**LC1 D40●●**
ATV 31HD15M3X	15	20	**NS100HMA**	100	22	**LC1 D40●●**
Three phase supply voltage: 380…500 V						
ATV 31H037N4	0.37	0.5	**GV2 L07**	2.5	5	**LC1 K0610●●**
ATV 31H055N4	0.55	0.75	**GV2 L08**	4	5	**LC1 K0610●●**
ATV 31H075N4	0.75	1	**GV2 L08**	4	5	**LC1 K0610●●**
ATV 31HU11N4	1.1	1.5	**GV2 L10**	6.3	5	**LC1 K0610●●**
ATV 31HU15N4	1.5	2	**GV2 L14**	10	5	**LC1 K0610●●**
ATV 31HU22N4	2.2	3	**GV2 L14**	10	5	**LC1 K0610●●**
ATV 31HU30N4	3	–	**GV2 L16**	14	5	**LC1 K0610●●**
ATV 31HU40N4	4	5	**GV2 L16**	14	5	**LC1 K0610●●**
ATV 31HU55N4	5.5	7.5	**GV2 L22**	25	22	**LC1 D09●●**
ATV 31HU75N4	7.5	10	**GV2 L32**	32	22	**LC1 D18●●**
ATV 31HD11N4	11	15	**NS80HMA**	50	22	**LC1 D32●●**
ATV 31HD15N4	15	20	**NS80HMA**	50	22	**LC1 D32●●**

(1) The HP values given are NEC-compliant (National Electrical Code).
(2) NS●●HMA: Product sold under the Merlin Gerin brand
(3) Composition of contactors:
   LC1-K06: 3 poles + 1 "N/O" auxiliary contact
   LC1-D09/D18/D32/D40: 3 poles + 1 "N/O" auxiliary contact and 1 "N/C" auxiliary contact
(4) Usual control circuit voltages

AC control circuit

	Volts ∼	24	48	110	220	230	240
LC1-K	50/60 Hz	**B7**	**E7**	**F7**	**M7**	**P7**	**U7**
	Volts ∼	24	48	110	220/230	230	230/240
LC1-D	50 Hz	**B5**	**E5**	**F5**	**M5**	**P5**	**U5**
	60 Hz	**B6**	**E6**	**F6**	**M6**	–	**U6**
	50/60 Hz	**B7**	**E7**	**F7**	**M7**	**P7**	**U7**

For other voltages between 24 V and 660 V, or a DC control circuit, please consult your Regional Sales Office.

Ⓣ **Telemecanique**

Variable speed drives
for asynchronous motors
Altivar 31
Motor starters

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GV2 L
+
LC1 K
+
ATV 31H●●●●●●

Motor starter for ATV 31H drive (continued)

Variable speed drive Reference	Standard power rating of 4-pole motors 50/60 Hz *(1)*		Circuit-breaker *(2)*		Max. prosp. line Isc	Contactor *(3)* Add the voltage reference to the basic reference to obtain the full reference *(4)*
			Reference	Rating		
	kW	*HP*		A	kA	
Three phase supply voltage: 525…600 V						
ATV 31H075S6X	0.75	*1*	**GV2 L08**	4	5	**LC1 K0610●●**
ATV 31HU15S6X	1.5	*2*	**GV2 L10**	6.3	5	**LC1 K0610●●**
ATV 31HU22S6X	2.2	*3*	**GV2 L14**	10	5	**LC1 K0610●●**
ATV 31HU40S6X	4	*5*	**GV2 L16**	14	5	**LC1 K0610●●**
ATV 31HU55S6X	5.5	*7.5*	**GV2 L20**	18	22	**LC1 K0610●●**
ATV 31HU75S6X	7.5	*10*	**GV2 L22**	25	22	**LC1 K0610●●**
ATV 31HD11S6X	11	*15*	**GV2 L32**	32	22	**LC1 D09●●**
ATV 31HD15S6X	15	*20*	**NS80HMA**	32	22	**LC1 D09●●**

(1) The HP values given are NEC-compliant (National Electrical Code).
(2) NS80HMA: Product sold under the Merlin Gerin brand
(3) Composition of contactors:
   LC1-K06 : 3 poles + 1 "N/O" auxiliary contact
   LC1-D09: 3 poles + 1 "N/O" auxiliary contact and 1 "N/C" auxiliary contact
(4) Usual control circuit voltages

AC control circuit

	Volts ∼	24	48	110	220	230	240
LC1-K	50/60 Hz	**B7**	**E7**	**F7**	**M7**	**P7**	**U7**
	Volts ∼	24	48	110	220/230	230	230/240
LC1-D	50 Hz	**B5**	**E5**	**F5**	**M5**	**P5**	**U5**
	60 Hz	**B6**	**E6**	**F6**	**M6**	–	**U6**
	50/60 Hz	**B7**	**E7**	**F7**	**M7**	**P7**	**U7**

For other voltages between 24 V and 660 V, or a DC control circuit, please consult your Regional Sales Office.

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2.3

Variable speed drives
for asynchronous motors
Altivar 31
Motor starters

Applications

The combinations listed below can be used to assemble a complete motor starter comprising a circuit-breaker, a contactor and an Altivar 31 variable speed drive.
The circuit-breaker provides protection against accidental short-circuits, isolation and padlocking, if required.
The contactor controls and manages any safety features and isolates the motor on stopping.
The Altivar 31 drive is protected electronically against short-circuits between phases and between phase and earth; it therefore ensures continuity of service and thermal protection of the motor.

Motor starter for ATV 31C drive

Variable speed drive Reference	Standard power rating for 4-pole motors 50/60 Hz (1)		Circuit-breaker (2)		Max. prosp. line Isc	Contactor (3) Add the voltage reference to the basic reference to obtain the full reference (4)
			Reference	Rating		
	kW	HP		A	kA	
Single phase supply voltage: 200…240 V						
ATV 31C018M2	0.18	0.25	**GV2 L08**	4	1	**LC1 K0610••**
ATV 31C037M2	0.37	0.5	**GV2 L10**	6.3	1	**LC1 K0610••**
ATV 31C055M2	0.55	0.75	**GV2 L14**	10	1	**LC1 K0610••**
ATV 31C075M2	0.75	1	**GV2 L14**	10	1	**LC1 K0610••**
ATV 31CU11M2	1.1	1.5	**GV2 L16**	14	1	**LC1 K0610••**
ATV 31CU15M2	1.5	2	**GV2 L20**	18	1	**LC1 K0610••**
ATV 31CU22M2	2.2	3	**GV2 L22**	25	1	**LC1 D09••**
Three phase supply voltage: 380…500 V						
ATV 31C037N4	0.37	0.5	**GV2 L07**	2.5	5	**LC1 K0610••**
ATV 31C055N4	0.55	0.75	**GV2 L08**	4	5	**LC1 K0610••**
ATV 31C075N4	0.75	1	**GV2 L08**	4	5	**LC1 K0610••**
ATV 31CU11N4	1.1	1.5	**GV2 L10**	6.3	5	**LC1 K0610••**
ATV 31CU15N4	1.5	2	**GV2 L14**	10	5	**LC1 K0610••**
ATV 31CU22N4	2.2	3	**GV2 L14**	10	5	**LC1 K0610••**
ATV 31CU30N4	3	–	**GV2 L16**	14	5	**LC1 K0610••**
ATV 31CU40N4	4	5	**GV2 L16**	14	5	**LC1 K0610••**
ATV 31CU55N4	5.5	7.5	**GV2 L22**	25	22	**LC1 D09••**
ATV 31CU75N4	7.5	10	**GV2 L32**	32	22	**LC1 D18••**
ATV 31CD11N4	11	15	**NS80HMA**	50	22	**LC1 D32••**
ATV 31CD15N4	15	20	**NS80HMA**	50	22	**LC1 D32••**

(1) The HP values given are NEC-compliant (National Electrical Code).
(2) NS80HMA: Product sold under the Merlin Gerin brand
(3) Composition of contactors:
 LC1 K06: 3 poles + 1 "N/O" auxiliary contact
 LC1 D09/D18/D32: 3 poles + 1 "N/O" auxiliary contact and 1 "N/C" auxiliary contact
(4) Usual control circuit voltages

AC control circuit

	Volts ∿	24	48	110	220	230	240
LC1-K	50/60 Hz	B7	E7	F7	M7	P7	U7
	Volts ∿	**24**	**48**	**110**	**220/230**	**230**	**230/240**
LC1-D	50 Hz	B5	E5	F5	M5	P5	U5
	60 Hz	B6	E6	F6	M6	–	U6
	50/60 Hz	B7	E7	F7	M7	P7	U7

For other voltages between 24 V and 660 V, or a DC control circuit, please consult your Regional Sales Office.

GV2 L
+
LC1 K
+
ATV 31C•••••

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Variable speed drives
for asynchronous motors
Altivar 31
Motor starters

Applications

The combinations listed below can be used to assemble a complete motor starter comprising a circuit-breaker, a contactor and an Altivar 31 variable speed drive.
The circuit-breaker provides protection against accidental short-circuits, isolation and padlocking, if required.
The contactor controls and manages any safety features and isolates the motor on stopping.
The Altivar 31 drive is protected electronically against short-circuits between phases and between phase and earth; it therefore ensures continuity of service and thermal protection of the motor.

Motor starter for ATV 31K drive

Variable speed drive Reference	Standard power rating for 4-pole motors 50/60 Hz (1)		Circuit-breaker (2)		Max. prosp. line Isc	Contactor (3) Add the voltage reference to the basic reference to obtain the full reference (4)
			Reference	Rating		
	kW	*HP*		A	kA	
Single phase supply voltage: 200…240 V						
ATV 31K018M2	0.18	*0.25*	**GV2 L08**	4	5	**LC1 K0610●●**
ATV 31K037M2	0.37	*0.5*	**GV2 L10**	6.3	5	**LC1 K0610●●**
ATV 31K055M2	0.55	*0.75*	**GV2 L14**	10	5	**LC1 K0610●●**
ATV 31K075M2	0.75	*1*	**GV2 L14**	10	5	**LC1 K0610●●**
ATV 31KU11M2	1.1	*1.5*	**GV2 L14**	14	22	**LC1 K0610●●**
ATV 31KU15M2	1.5	*2*	**GV2 L20**	18	22	**LC1 K0610●●**
ATV 31KU22M2	2.2	*3*	**GV2 L22**	25	22	**LC1 D09●●**
Three phase supply voltage: 380…500 V						
ATV 31K037N4	0.37	*0.5*	**GV2 L07**	2.5	5	**LC1 K0610●●**
ATV 31K055N4	0.55	*0.75*	**GV2 L08**	4	5	**LC1 K0610●●**
ATV 31K075N4	0.75	*1*	**GV2 L08**	4	5	**LC1 K0610●●**
ATV 31KU11N4	1.1	*1.5*	**GV2 L10**	6.3	5	**LC1 K0610●●**
ATV 31KU15N4	1.5	*2*	**GV2 L14**	10	5	**LC1 K0610●●**
ATV 31KU22N4	2.2	*3*	**GV2 L14**	10	5	**LC1 K0610●●**
ATV 31KU30N4	3	*–*	**GV2 L16**	14	5	**LC1 K0610●●**
ATV 31KU40N4	4	*5*	**GV2 L16**	14	5	**LC1 K0610●●**
ATV 31KU55N4	5.5	*7.5*	**GV2 L22**	25	22	**LC1 D09●●**
ATV 31KU75N4	7.5	*10*	**GV2 L32**	32	22	**LC1 D18●●**
ATV 31KD11N4	11	*15*	**NS80 HMA**	50	22	**LC1 D32●●**
ATV 31KD15N4	15	*20*	**NS80 HMA**	50	22	**LC1 D32●●**

(1) The HP values given are NEC-compliant (National Electrical Code).
(2) NS80HMA: Product sold under the Merlin Gerin brand
(3) Composition of contactors:
  LC1 K06: 3 poles + 1 "N/O" auxiliary contact
  LC1 D09/D18/D32: 3 poles + 1 "N/O" auxiliary contact and 1 "N/C" auxiliary contact
(4) Usual control circuit voltages

AC control circuit

	Volts ∼	24	48	110	220/230	230	230/240
LC1-K	50/60 Hz	**B7**	**E7**	**F7**	**M7**	**P7**	**U7**
	Volts ∼	24	48	110	220	230	240
LC1-D	50 Hz	**B5**	**E5**	**F5**	**M5**	**P5**	**U5**
	60 Hz	**B6**	**E6**	**F6**	**M6**	**–**	**U6**
	50/60 Hz	**B7**	**E7**	**F7**	**M7**	**P7**	**U7**

For other voltages between 24 V and 660 V, or a DC control circuit, please consult your Regional Sales Office.

Functions

Variable speed drives
for asynchronous motors
Altivar 31

563712

PowerSuite for PC welcome screen

2

2.3

Summary of functions

Drive factory setting

Functions of the display and keys

Application functions

Spooling functions

Compatibility of functions

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Functions (continued)

Variable speed drives
for asynchronous motors
Altivar 31

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2.3

Drive factory setting

The drive is supplied ready for use in most applications, with the following functions and settings:

- Nominal motor frequency: 50 Hz
- Motor voltage: 230 V (ATV 31H●●●M2 and M3X), 400 V (ATV 31H●●●N4) or 600 V (ATV 31H●●●S6X)
- Linear ramp times: 3 seconds
- Low speed (LSP): 0 Hz, high speed (HSP): 50 Hz
- Normal stop mode on deceleration ramp
- Stop mode in the event of a fault: Freewheel
- Motor thermal current = nominal drive current
- Standstill injection braking current = 0.7 x nominal drive current, for 0.5 seconds
- Constant torque operation, with sensorless flux vector control
- Logic inputs:
  □ 2 directions of operation (LI1, LI2), 2-wire control
  □ 4 preset speeds (LI3, LI4): LSP (low speed), 10 Hz, 15 Hz, 20 Hz
- Analog inputs:
  □ AI1 speed reference (0 +10 V)
  □ AI2 (0 ± 10 V) summing of AI1
  □ AI3 (4-20 mA) not configured
- Relay R1: fault relay
- Relay R2: not assigned
- Analog output AOC: 0-20 mA, image of the motor frequency
- Automatic adaptation of the deceleration ramp in the event of excessive braking
- Switching frequency 4 kHz, random frequency

Functions of the display and keys
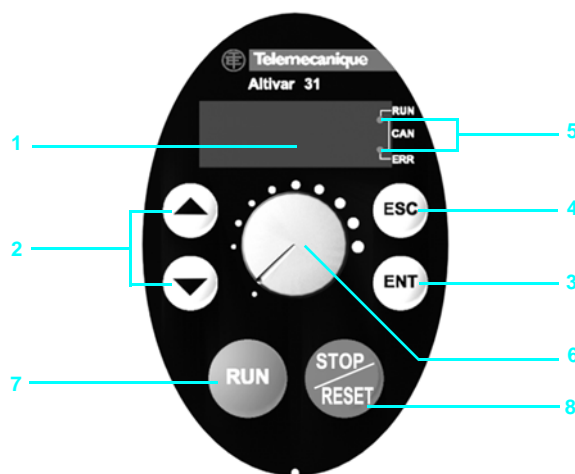
1 Information is displayed in the form of codes or values in four 7-segment displays
2 Buttons for scrolling through the menus or modifying values.
3 ENT: Validation button for entering a menu or confirming the new value selected.
4 ESC: Button for exiting the menus (no confirmation)
5 2 diagnostic LEDs for the CANopen bus

- For ATV 31H●●●●M2A, ATV 31H●●●M3XA and ATV 31H●●●N4A drives only:
6 Speed reference potentiometer
7 RUN: Local control of motor operation
8 STOP/RESET: Controls motor stopping locally and resets any faults

| Presentation: pages 2/100 to 2/107 | Characteristics: pages 2/108 to 2/111 | References: pages 2/112 to 2/115 | Dimensions: pages 2/126 to 2/131 | Schemes: pages 2/132 to 2/135 |

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Functions (continued)

Variable speed drives
for asynchronous motors
Altivar 31

2

2.3

Remote display terminal

■ Remote display terminal option
The remote display terminal can be mounted on the door of a wall-fixing or floor-standing enclosure.
It comprises an LCD display with programming and control keys and a switch for locking access to the menus.
Drive control keys:
□ FWD/RV: reversal of the direction of rotation
□ RUN: motor run command
□ STOP/RESET: motor stop command or fault reset
The speed reference is given by the remote display terminal. Only the freewheel, fast stop and DC injection stop commands remain active on the terminals. If the drive/operator terminal link is broken, the drive locks in fault mode.
Its subsequent action depends on the control and reference channel programming.

Note: *Protection via customer confidential code has priority over the switch.*

■ Menu access levels
There are 3 access levels:
□ Level 1: access to standard functions. Significantly, this level is interchangeable with the Altivar 28.
□ Level 2: access to advanced application functions.
□ Level 3: access to advanced application functions and management of mixed control modes.

■ Menu access code
Enables the drive configuration to be protected using an access code.
When access is locked using a code, only the adjustment and monitoring parameters can be accessed.

Application functions

■ Operating speed range
Used to determine the 2 frequency limits which define the speed range permitted by the machine under actual operating conditions for all applications with or without overspeed.
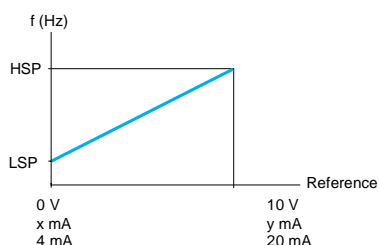
LSP: low speed, from 0 to HSP, factory setting 0
HSP: high speed, from LSP to f max., factory setting 50 Hz
x : configurable between 0 and 20 mA, factory setting 4 mA
y: configurable between 4 and 20 mA, factory setting 20 mA

■ Acceleration and deceleration ramp times
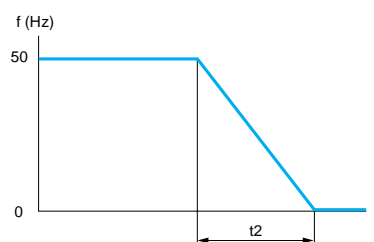Used to define acceleration and deceleration ramp times according to the application and the machine dynamics.
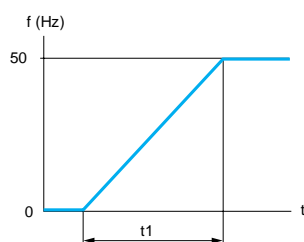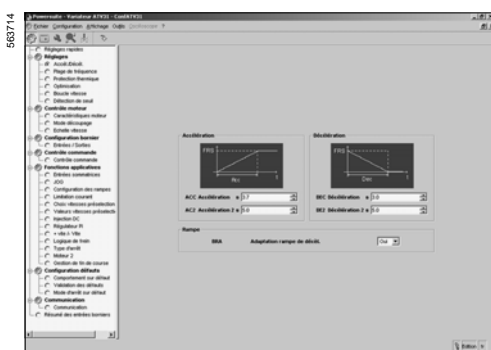

Linear acceleration ramp   **Linear deceleration ramp**

t1: acceleration time
t2: deceleration time
t1 and t2 can be set independently between 0.1 and 999.9 s, factory setting: 3 s

Ramp adjustment with PowerSuite for PC

Telemecanique

Functions (continued)

Variable speed drives
for asynchronous motors
Altivar 31

2

2.3

■ Acceleration and deceleration ramp profile
Used to gradually increase the output frequency starting from a speed reference, following a linear ratio or a preset ratio.
□ For applications such as material handling, packaging, transportation of people: the use of S ramps takes up mechanical play and eliminates jolts, and limits "non-following" of speed during rapid transient operation of high inertia machines.
□ For pumping applications (installation with centrifugal pump and non-return valve): valve closing can be controlled more accurately if U ramps are used.
□ Selecting "linear", "S", "U" or customized profiles assigns both the acceleration and deceleration ramps.

S ramps	U ramps	Customized ramps
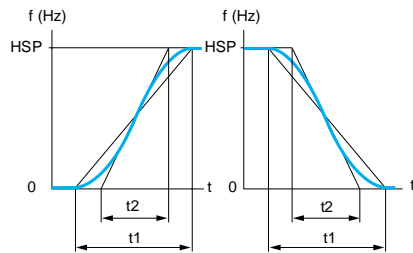
HSP: high speed
t1: ramp time set
t2 = 0.6 x t1
The curve coefficient is fixed.
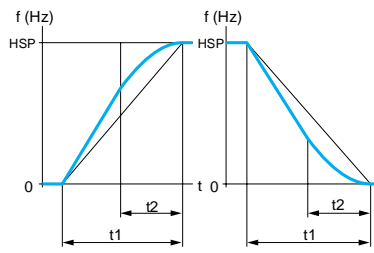
HSP: high speed
t1: ramp time set
t2 = 0.5 x t1
The curve coefficient is fixed.
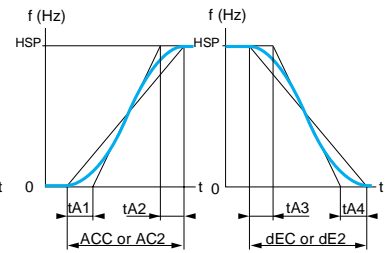
HSP: high speed
tA1: can be set between 0 and 100% (of ACC or AC2)
tA2: can be set between 0 and (100% - tA1) (of ACC or AC2)
tA3: can be set between 0 and 100% (of dEC or dE2)
tA4: can be set between 0 and (100% - tA3) (of dEC or dE2)
ACC: acceleration ramp 1 time
AC2: acceleration ramp 2 time
dEC: deceleration ramp 1 time
dE2: deceleration ramp 2 time

■ Ramp switching
Used to switch 2 acceleration and deceleration ramp times, which can be adjusted separately.
Ramp switching can be enabled by:
□ a logic input
□ a frequency threshold
□ a combination of logic input and frequency threshold

Function suitable for:
□ material handling with smooth starting and approach
□ machines with fast steady state speed correction
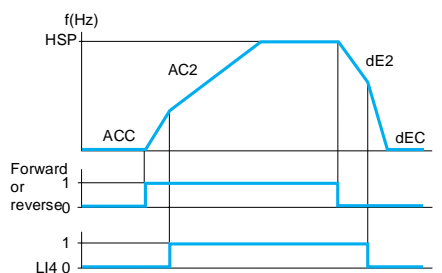
Acceleration 1 (ACC) and deceleration 1 (dEC):
- adjustment 0.1 to 999.9 s
- factory setting 3 s
Acceleration 2 (AC2) and deceleration 2 (dE2):
- adjustment 0.1 to 999.9 s
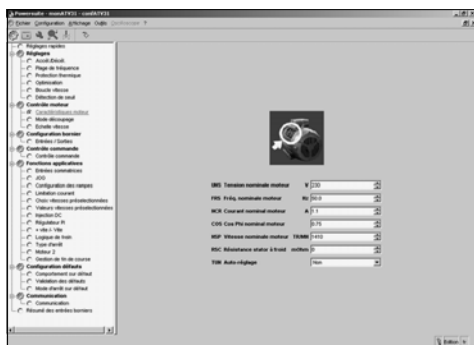- factory setting 5 s
HSP: high speed

Example of switching using logic input LI4

Functions (continued)

Variable speed drives
for asynchronous motors
Altivar 31

Adjustment of the voltage/frequency ratio with PowerSuite for PC

■ **Automatic adaptation of deceleration ramp**

Used to automatically adapt the deceleration ramp if the initial setting is too low when the load inertia is taken into account. This function avoids the drive locking in the event of an **excessive braking** fault.

Function suitable for all applications not requiring precise stopping and not using braking resistors.

Automatic adaptation must be cancelled if the machine has position control with stopping on a ramp and a braking resistor installed. This function is automatically disabled if the brake sequence is configured.

■ **Voltage/frequency ratio**

□ Motor and power supply characteristics

Used to determine the limit values for the voltage/frequency ratio according to the line supply, the motor and the application.

The following values should be set for variable or constant torque applications with or without overspeed:
   - the base frequency corresponding to the supply
   - the nominal motor frequency (in Hz) given on the motor rating plate
   - the nominal motor voltage (in V) given on the motor rating plate
   - the maximum output frequency of the drive (in Hz)

□ Type of voltage/frequency ratio

Used to adapt the voltage/frequency ratio to the application in order to optimize performance for the following applications:
   - Constant torque applications (machines with average loads operating at low speed) with motors connected in parallel or special motors (e.g.: resistive cage motor): ratio **L**
   - Variable torque applications (pumps, fans): ratio **P**
   - Machines with heavy loads operating at low speed, machines with fast cycles, with (sensorless) flux vector control: ratio **n**
   - Energy saving, for machines with slow speed and torque variations: ratio **nLd** Voltage is automatically reduced to a minimum according to the necessary torque.
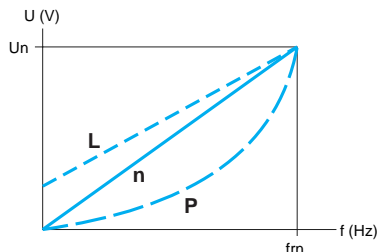
Un: Nominal motor voltage
frn: Nominal motor frequency

■ **Auto-tuning**

Auto-tuning may be performed:
voluntarily by the operator using dialogue tools via local control mode or the serial link
□ each time the drive is switched on
□ on each run command
□ by enabling a logic input
Auto-tuning is used to optimize application performance.

■ **Switching frequency, noise reduction**

The switching frequency setting permits a reduction in the noise generated by the motor.

The switching frequency is modulated randomly in order to avoid resonance. This function can be disabled if it causes instability.

Switching the intermediate DC voltage at high frequency is useful for supplying the motor with a current wave having little harmonic distortion. The switching frequency is adjustable during operation to reduce the noise generated by the motor.

Value: 2 to 16 kHz, with a factory setting of 4 kHz.

For all applications which require low motor noise.

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Functions (continued)

Variable speed drives
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■ Skip frequencies

This function suppresses one or two critical speeds that may cause mechanical resonance.

It is possible to prohibit the prolonged operation of the motor on 1 or 2 frequency bands (with a bandwidth of ± 1 Hz), which can be set within the operating range.

Function suitable for lightweight machines, bulk product conveyors with unbalanced motor, fans and centrifugal pumps.
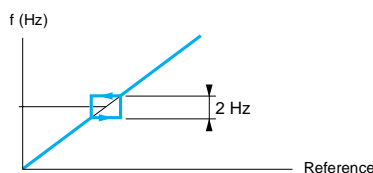
Motor speed change depending on the skip frequency reference

■ Speed reference

The speed reference can have different sources depending on the drive configuration:
□ references provided by 3 analog inputs
□ the potentiometer reference (for ATV 31●●●A drives only)
□ the +/- speed function via logic input, using the keypad or remote display terminal keys
□ the remote display terminal reference
□ speed references provided by the communication bus or networks

These different sources are managed by programming the reference functions and channels.

■ Analog inputs

There are 3 analog inputs:
□ 2 voltage inputs:
  - 0-10 V (AI1)
  - ± 10 V (AI2)
□ 1 current input:
  - X-Y mA (AI3) where X is configurable between 0 and 20 mA, and Y is configurable between 4 and 20 mA.

Adjustment of preset speeds with PowerSuite for PC
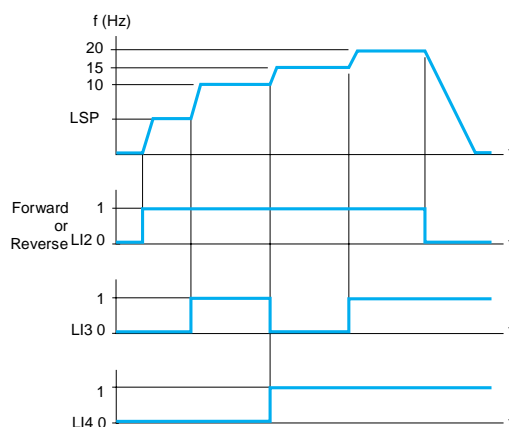
■ Preset speeds

Used to switch preset speed references.
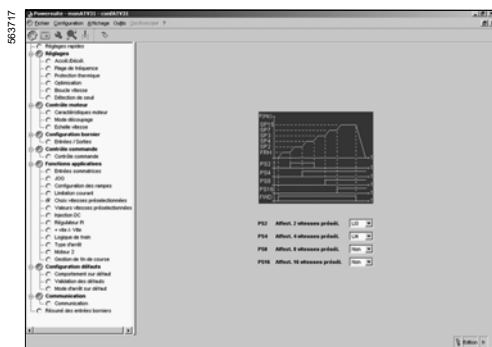Choose between two, four, eight or sixteen preset speeds.
Enabled by means of 1, 2, 3 or 4 logic inputs.
The preset speeds can be adjusted in increments of 0.1 Hz from 0 Hz to 500 Hz.
Function suitable for material handling and machines with several operating speeds.

The speed obtained with inputs LI3 and LI4 at state 0 is LSP or the speed reference, depending on the level of analog inputs AI1, AI2 and AI3.

Factory settings:

1st speed: LSP (low speed or speed reference)

2nd speed: 10 Hz

3rd speed: 15 Hz

4th speed: 20 Hz (high speed)

Example of operation with 4 preset speeds and 2 logic inputs

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*Adjustment of the "+/- speed" function with PowerSuite for PC*

■ +/- speed

Used to increase or decrease a speed reference by means of 1 or 2 logic inputs, with or without the last reference being saved (motorized potentiometer function).
This function is suitable for centralized control of a machine with several sections operating in one direction or for control by a pendant control station of a handling crane with two operating directions.

Two types of operation are available:
□ Use of single action buttons: two logic inputs are required in addition to the operating direction(s).
The input assigned to the "+ speed" command increases the speed, the input assigned to the "- speed" command decreases the speed.
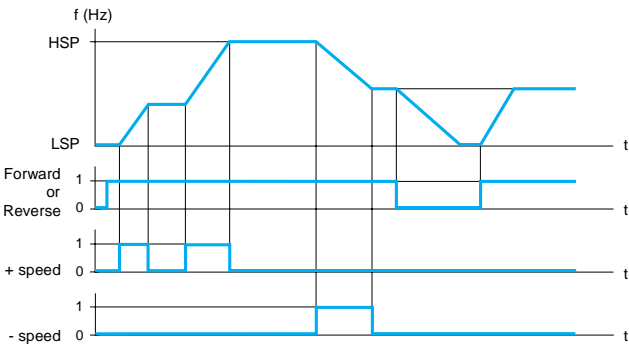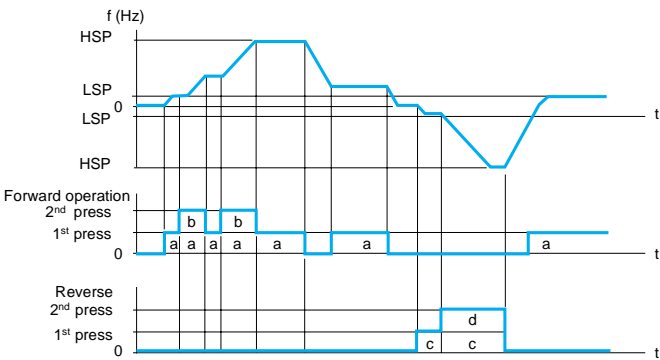

Example of "+/- speed" with 2 logic inputs, single action buttons and reference saving

□ Use of double action buttons (only one logic input assigned to "+ speed" is necessary):

Logic inputs:

a and c: 1st press
b and d: 2nd press
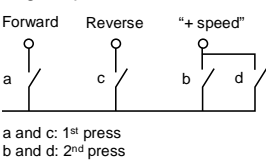
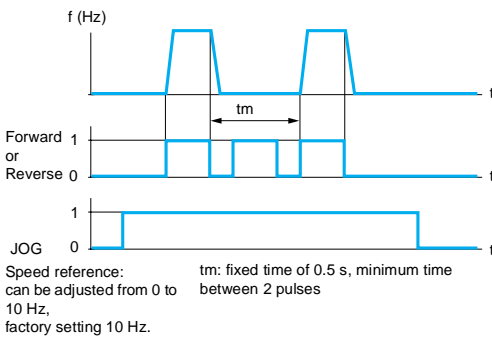|	**Released** (- speed)	**1st press** (speed maintained)	**2nd press** (+ speed)
Forward button	–	a	a and b
Reverse button	–	c	c and d

LSP: low speed, HSP: high speed

Example with double action buttons and 1 logic input
Note: *This type of "+/- speed" control is incompatible with 3-wire control.*

■ Save reference

This function is associated with "+/- speed" control.
Enables the reading and saving of the last speed reference prior to the loss of the run command or line supply. The saved reference is applied at the next run command.

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Functions (continued)

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tm: fixed time of 0.5 s, minimum time between 2 pulses

Speed reference: can be adjusted from 0 to 10 Hz, factory setting 10 Hz.

Example of jog operation

■ Jog operation
Used for pulse operation with minimum ramp times (0.1 s), limited speed reference and minimum time between 2 pulses.
Enabled by a logic input and pulses given by the operating direction command.

This function is suitable for machines with product insertion in manual mode (example: gradual movement of the mechanism during maintenance operations).

■ Control and reference channels
There are several control and reference channels which can be independent.
Commands (forward, reverse, etc.) and speed references can be sent using the following methods:
□ terminals (logic and analog inputs)
□ keypad for ATV 31●●●A only (RUN/STOP and potentiometer)
□ ATV 31 keypad
□ via the serial link
  - remote display terminal
  - Modbus control word
  - CANopen control word

The control and speed reference channels can be separate.
Example: speed reference issued by CANopen and command issued by the remote display terminal.

Note: The Stop keys on the keypad and the remote display terminal may retain priority. The summing inputs and PI regulator functions only apply to one reference channel.
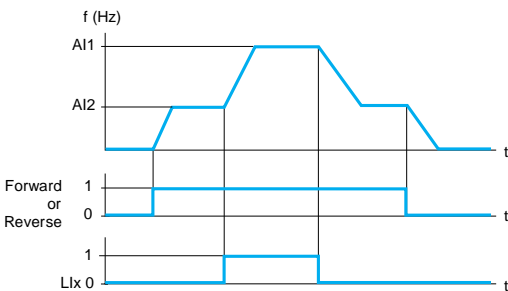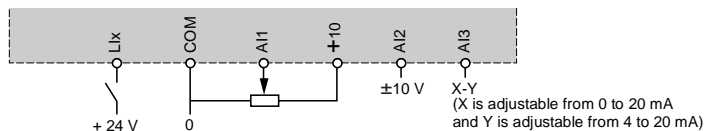
■ Reference switching
Switching between 2 speed references can be enabled via:
□ a logic input
□ a bit in a Modbus or CANopen control word
Reference 1 is active if the logic input (or control word bit) is at 0, reference 2 is active if the logic input (or control word bit) is at 1.
The reference can be switched with the motor running.

Example of reference switching

Connection diagram for reference switching

■ Summing inputs
Used to add up 2 or 3 speed references from different sources.
The references to be added together are selected from all the possible types of speed reference.
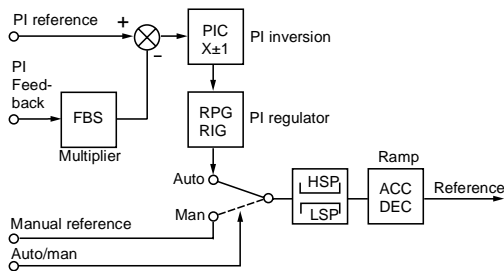Example:
Reference 1 sent by AI1
Reference 2 sent by AI2
Reference 3 sent by AIP
Drive speed reference: reference 1 + reference 2 + reference 3.

| Presentation: pages 2/100 to 2/107 | Characteristics: pages 2/108 to 2/111 | References: pages 2/112 to 2/115 | Dimensions: pages 2/126 to 2/131 | Schemes: pages 2/132 to 2/135 |

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Functions *(continued)*

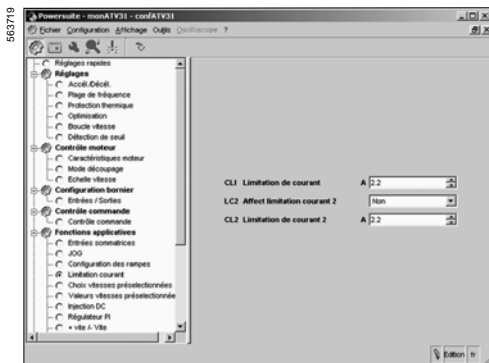# Variable speed drives
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ACC: Acceleration
DEC: Deceleration
FBS: PI feedback multiplication coefficient
HSP: High speed
PIC: Reversal of the direction of correction of the PI regulator
LSP: Low speed
RIG: PI regulator integral gain
RPG: PI regulator proportional gain

PI regulator

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Configuration of current switching with PowerSuite for PC

■ **PI regulator**
Used for simple control of a flow rate or a pressure with a sensor which supplies a feedback signal adapted to the drive.
This function is suitable for pumping and ventilation applications.

□ **PI reference:**
- internal regulator reference, adjustable from 0 to 100
- regulation reference selected from all the possible types of regulation reference
- preset PI references
□ **2 or 4 preset PI references**, adjustable from 0 to 100, require the use of 1 or 2 logic inputs respectively
□ **Manual reference**
- speed reference selected from all the possible types of speed reference
□ **PI feedback:**
- analog input AI1, AI2 or AI3
□ **Auto/Man:**
- logic input LI for switching operation to speed reference (Man) or PI regulation (Auto).
During operation in automatic mode it is possible to adapt the process feedback, to correct inverse PI, to adjust the proportional and integral gain and to apply a ramp (time = ACC - DEC) for establishing the PI action on starting and stopping.
The motor speed is limited to between LSP and HSP.

Note: The PI function is incompatible with the preset speeds and JOG functions. The PI reference can also be transmitted on line via the Modbus RS 485 serial link or via the CANopen bus.

■ **Current limit switching**
A 2nd current limit can be configured between 0.25 and 1.5 times the nominal drive current.
Used to limit the torque and the temperature rise of the motor.
Switching between 2 current limits can be enabled via:
□ a logic input
□ a bit in a Modbus or CANopen control word

■ **Limiting low speed operating time**
The motor is stopped automatically after a period of operation at low speed (LSP) with a zero reference and a run command present.
This time can be set between 0.1 and 999.9 seconds (0 corresponds to an unlimited time). Factory setting: 0 s. The motor restarts automatically on the ramp when the reference reappears or if the run command is interrupted and then re-established.
This function is suitable for automatic stopping/starting on pressure-regulated pumps.

■ **Motor switching**
Allows two motors with different powers to be supplied successively by the same drive. Switching must take place with the drive stopped and locked, using an appropriate sequence at the drive output.
The function can be used to adapt the motor parameters. The following parameters are switched automatically:
□ nominal motor voltage
□ nominal motor frequency
□ nominal motor current
□ nominal motor speed
□ motor cosine Phi
□ selection of the type of voltage/frequency ratio for motor 2
□ IR compensation, motor 2
□ motor frequency loop gain
□ motor stability
□ motor slip compensation
Motor thermal protection is disabled by this function.
Motor switching can be enabled by:
□ a logic input
□ a bit in a Modbus or CANopen control word
With hoisting applications, this function enables a single drive to be used for vertical and horizontal movements.

Functions (continued)

Variable speed drives
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2.3

■ Control mode switching
Control channel switching provides a choice of 2 operating modes. Switching can be enabled by:
□ a logic input
□ a bit in a Modbus or CANopen control word

■ 2-wire control
Used to control the direction of operation by means of a stay-put contact.
Enabled by means of 1 or 2 logic inputs (one or two directions).
This function is suitable for all non-reversing and reversing applications.
3 operating modes are possible:
□ detection of the state of the logic inputs
□ detection of a change in state of the logic inputs
□ detection of the state of the logic inputs with forward operation always having priority over reverse
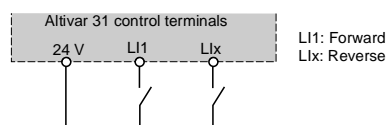
Wiring diagram for 2-wire control

■ 3-wire control
Used to control the operating direction and stopping by means of pulsed contacts.
Enabled by means of 2 or 3 logic inputs (non-reversing or reversing).
This function is suitable for all non-reversing and reversing applications.
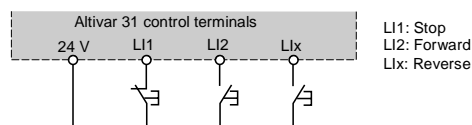
Wiring diagram for 3-wire control

Example of operation with 3-wire control

■ Forced local mode
Forced local mode imposes control via the terminals or operator terminal and prohibits all other control modes.
The following references and commands are available for forced local mode:
□ references AI1, or AI2, or AI3 and control via logic inputs
□ reference and control via RUN/STOP keys and potentiometer (ATV 31●●●A drives only)
□ reference and control via the remote display terminal
The changeover to forced local mode is enabled by a logic input.

■ Freewheel stop
This function stops the motor by resistive torque if the motor power supply is cut.
A freewheel stop is achieved:
□ by configuring a normal stop command as a freewheel stop (on disappearance of a run command or appearance of a stop command)
□ by enabling a logic input

■ Fast stop
Used to achieve a braked stop with an acceptable deceleration ramp time (divided by 2 to 10) for the drive/motor unit to avoid locking on an excessive braking fault.
Used for conveyors with emergency stop electrical braking.
A fast stop is achieved:
□ by configuring a normal stop as a fast stop (on disappearance of a run command or appearance of a stop command)
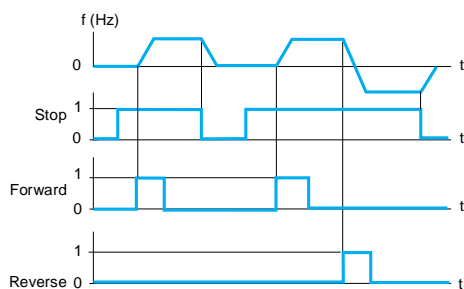□ by enabling a logic input

■ DC injection stop
Used to brake (at low speed) high inertia fans, or to maintain torque on stopping in the case of fans located in an airflow.
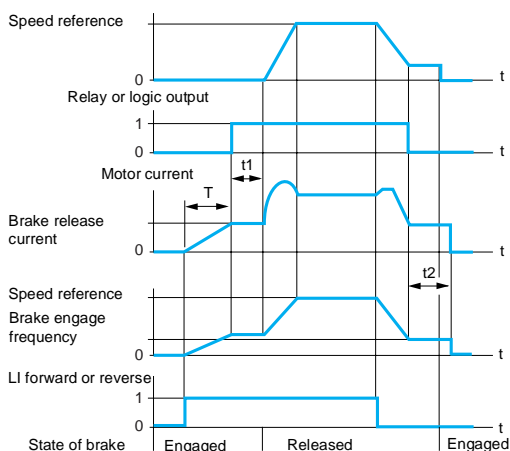A DC injection stop is achieved:
□ by configuring a normal stop as a DC injection stop (on disappearance of a run command or appearance of a stop command)
□ by enabling a logic input
The DC value and the standstill braking time are adjustable.

Presentation:
pages 2/100 to 2/107

Characteristics:
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Accessible settings:
t1: Brake release time delay
t2: Brake engage time delay

Brake control

■ **Brake control**

Used to manage control of an electromagnetic brake in synchronization with the starting and stopping of the motor to avoid jolts and load veering.
The brake control sequence is managed by the drive.
Values that can be adjusted for releasing the brake: current threshold and time delay
Values that can be adjusted for engaging the brake: frequency threshold and time delay
Enabled: by relay logic output R2 or logic output AOC assigned to brake control.
Function suitable for material handling applications with movements equipped with electromagnetic brakes (hoisting) and machines requiring a parking brake (unbalanced machines).

❑ **Principle:**
  - Vertical lifting movement:
Maintains motor torque in an upward direction when the brake is being released and engaged, in order to hold the load, and start smoothly as soon as the brake is released.
  - Horizontal lifting movement:
Synchronizes brake release with the build-up torque on starting and brake engage at zero speed on stopping, in order to prevent jerking.
Recommended settings for brake control for a vertical lifting application (for a horizontal lifting application set the current threshold to zero):
  - Brake release current: Adjust the brake release current to the nominal current indicated on the motor. If, during testing, the torque is insufficient, increase the brake release current (the maximum value is imposed by the drive).
  - Acceleration time: For lifting applications it is advisable to set the acceleration ramps to more than 0.5 seconds. Ensure that the drive does not change to current limiting.
The same recommendation applies for deceleration.
Note: For a lifting movement, a braking resistor should be used. Ensure that the settings and configurations selected cannot cause a drop or a loss of control of the lifted load.
  - Brake release time delay t1: Adjust according to the type of brake. It is the time required for the mechanical brake to release.
  - Brake engage frequency: Set to twice the nominal slip then adjust according to the result.
  - Brake engage time delay t2: Adjust according to the type of brake. It is the time required for the mechanical brake to engage.

■ **Management of limit switch**
Used to manage the operation of one or two limit switches (with 1 or 2 operating directions).
Each limit (forward, reverse) is associated with a logic input. The type of stop that occurs on detection of a limit can be configured as normal, freewheel or fast.
Following a stop, the motor is permitted to restart in the opposite direction only.

■ **Monitoring**
The following data can be displayed:
❑ frequency reference
❑ internal PI reference
❑ frequency reference (absolute value)
❑ output frequency applied to the motor (value signed in two's complement)
❑ output value in customer units
❑ current in the motor
❑ motor power: 100% = nominal power
❑ line voltage
❑ motor thermal state:
100% : nominal thermal state, 118%: motor overload threshold
❑ drive thermal state:
100% : nominal thermal state, 118%: drive overload threshold
❑ motor torque: 100% = nominal torque
❑ last fault
❑ operating time
❑ auto-tuning status
❑ configuration and state of logic inputs
❑ configuration of analog inputs
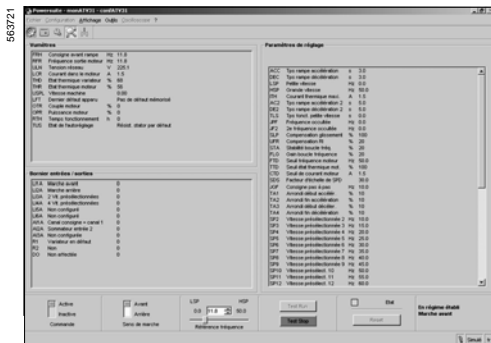
Monitoring the different parameters with PowerSuite for PC
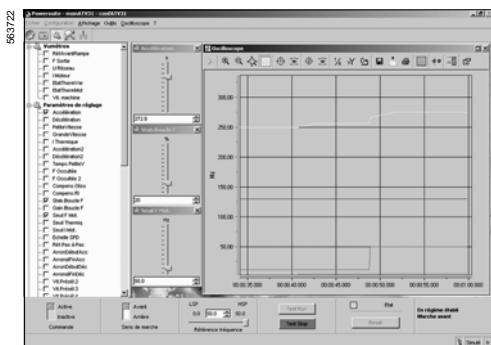
Monitoring the different parameters with the oscilloscope function in PowerSuite for PC

Functions (continued)

Variable speed drives
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Fault management with PowerSuite for PC

■ **Fault management**
There are different modes of operation on a resettable fault:
□ freewheel stop
□ drive switches to the fallback speed
□ the drive maintains the speed at which it was operating when the fault occurred until the fault disappears
□ stop on ramp
□ fast stop
The detected resettable faults are as follows:
□ drive overheating
□ motor overheating
□ CANopen bus fault
□ Modbus serial link failure
□ external faults
□ loss of 4-20 mA signal

■ **Fault reset**
Used to clear the last fault by means of a logic input.
The restart conditions after a reset to zero are the same as those of a normal power-up.
Resets the following faults: overvoltage, overspeed, external fault, drive overheating, motor phase loss, DC bus overvoltage, loss of 4-20 mA reference, load veering, motor overload if the thermal state is less than 100%, serial link fault.
Line supply undervoltage and line supply phase loss faults are reset automatically when the line supply is restored.
Function suitable for applications where the drives are difficult to access, for example on moving parts in material handling systems.

■ **General reset (disables all faults)**
This function can be used to inhibit all faults, including thermal protection (forced operation), and may cause irreparable damage to the drive.
This invalidates the warranty.

Function suitable for applications where restarting can be vital (conveyor in a furnace, smoke extraction system, machines with hardening products that need to be removed).
The function is enabled by a logic input.
Fault monitoring is active if the logic input is at state 1.
All faults are reset on a change of state ⌐ of the logic input.

■ **Controlled stop on loss of line supply**
Used to control motor stopping on a loss of line supply.
Function suitable for material handling, machines with high inertia, continuous product processing machines.
Type of stop possible:
□ locking of the drive and freewheel stop
□ stop which uses the mechanical inertia to maintain the drive power supply as long as possible
□ stop on ramp
□ fast stop (depends on the inertia and the braking ability of the drive)

■ **Stop mode in the event of a fault**
The type of stop that occurs on detection of a fault can be configured as normal, freewheel or fast for the following faults:
□ external fault (detection enabled by a logic input or a bit in a Modbus or CANopen control word)
□ motor phase loss fault
If a downstream contactor is being used between the drive and the motor, the motor phase loss fault should be inhibited.

Functions *(continued)*

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■ **Automatic catching of a spinning load with speed detection** ("catch on the fly")
Used to restart the motor smoothly after one of the following events, provided the run command is still present:
□ loss of line supply or simple switch off
□ fault reset or automatic restart
□ freewheel stop

On disappearance of the event, the effective speed of the motor is detected in order to restart on a ramp at this speed and return to the reference speed. The speed detection time can be up to 1 s depending on the initial deviation.
This function is automatically disabled if the brake sequence is configured.
This function is suitable for machines where the speed loss is negligible during the time over which the line supply is lost (machines with high inertia), fans and pumps driven by a residual flow, etc.

■ **Automatic restart**
Enables the drive to be restarted automatically after locking following a fault if this fault has disappeared and if the other operating conditions permit a restart.
This restart is performed by a series of automatic attempts separated by increasingly longer wait periods of 1 s, 5 s, 10 s then 1 minute for the rest.
The whole restart procedure can last anywhere between 5 minutes and an unlimited time.
If the drive has not restarted after the configured time, it will lock and the procedure is abandoned until it has been switched off and on again.

The faults which permit this type of restart are:
□ line supply overvoltage
□ motor thermal overload
□ drive thermal overload
□ DC bus overvoltage
□ failure of a line supply phase
□ external fault
□ loss of 4-20 mA reference
□ CANopen bus fault
□ Modbus serial link fault
□ line supply voltage too low. For this fault, the function is always active, even if it is not configured.
For these types of fault, the relay configured as a fault relay remains activated if the function is configured. The speed reference and direction of operation must be maintained for this function.
This function is suitable for machines or installations which are in continuous operation or are not monitored, and where a restart will not endanger equipment or personnel in any way.

■ **Derated operation in the event of an undervoltage**
The line voltage monitoring threshold is lowered to 50% of the motor voltage.
In this case, a line choke must be used and the performance of the drive cannot be guaranteed.

■ **Fault relay, unlocking**
The fault relay is energized when the drive is powered up and is not faulty.
It contains a "C/O common point contact.
The drive can be unlocked after a fault in one of the following ways:
□ by powering down until the ON LED extinguishes, then switching the power back on
□ by assigning a logic input to the reset faults function
□ by the automatic restart function, if it has been configured

■ **Operating time reset to zero**
The drive operating time can be reset to zero.

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■ Motor thermal protection
Indirect motor thermal protection is implemented via continuous calculation of its theoretical temperature rise.
Thermal protection can be adjusted from 0.2 to 1.5 times the nominal drive current.
This function is suitable for applications with self-cooled motors.
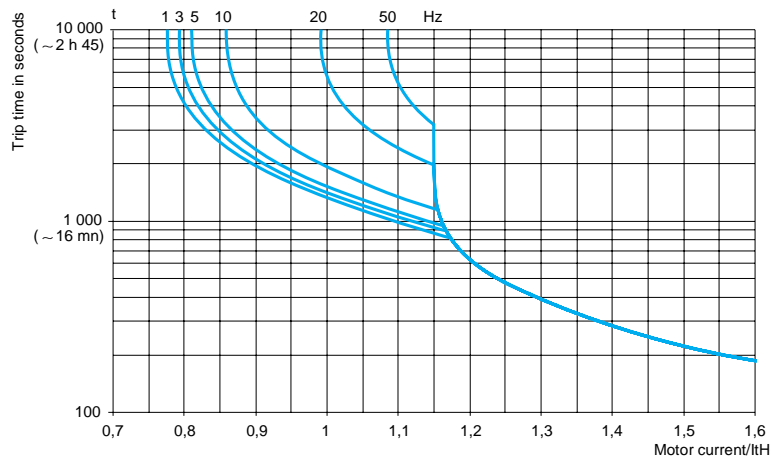
Motor thermal protection curves

■ Drive thermal protection
Thermal protection, by a PTC probe mounted on the heatsink or integrated in the power module, ensures that the drive is protected in the event of poor ventilation or excessive ambient temperatures.
Locks the drive in the event of a fault.
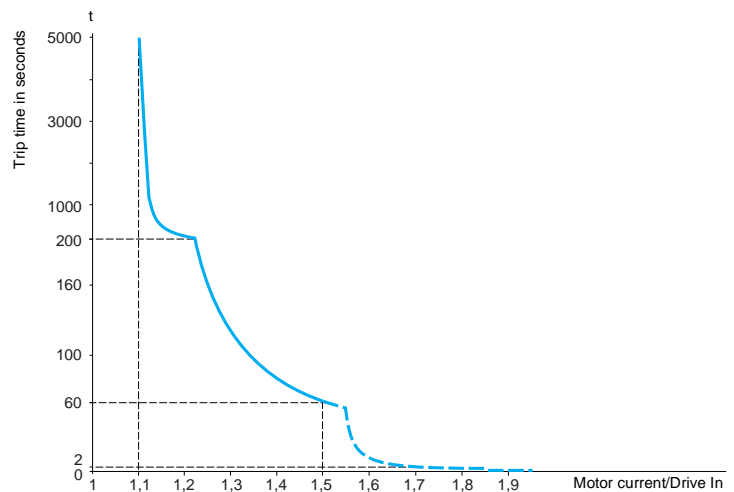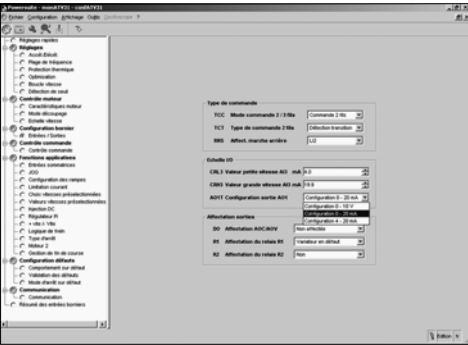

■ R1/R2 relay configuration
The following states are signalled when the relay is powered on:
□ drive fault
□ drive running
□ frequency threshold reached
□ high speed reached
□ current threshold reached
□ frequency reference reached
□ motor thermal threshold reached
□ brake sequence (R2 only)

Functions (continued)

Variable speed drives
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Configuration of AOC/AOV outputs with PowerSuite for PC

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2.3

■ **AOC/AOV analog outputs**
The same data is available on analog outputs AOC and AOV.
The following assignments are possible:
□ motor current
□ motor frequency
□ motor torque
□ power supplied by the drive
□ drive fault
□ frequency threshold reached
□ high speed reached
□ current threshold reached
□ frequency reference reached
□ motor thermal threshold reached
□ brake sequence
The adjustment of analog outputs AOC/AOV is used to modify the characteristics of
the current analog output AOC or the voltage analog output AOV.
AOC: can be set as 0-20 mA or 4-20 mA
AOV: can be set at 0-10 V

■ **Saving and retrieving the configuration**
A configuration can be saved to the EEPROM. This function is used to store a
configuration in addition to the current configuration.
Retrieving this configuration clears the current configuration.

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| Presentation: | Characteristics: | References: | Dimensions: | Schemes: |
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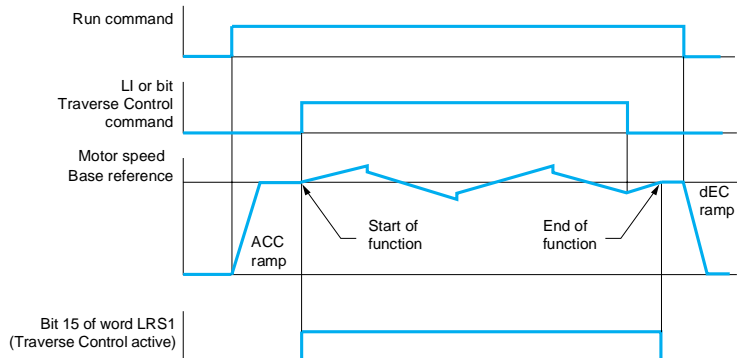## Spooling functions (in textile applications)
Function only available with ATV 31●●●●T drives
■ **Traverse Control**
Function for winding reels of thread
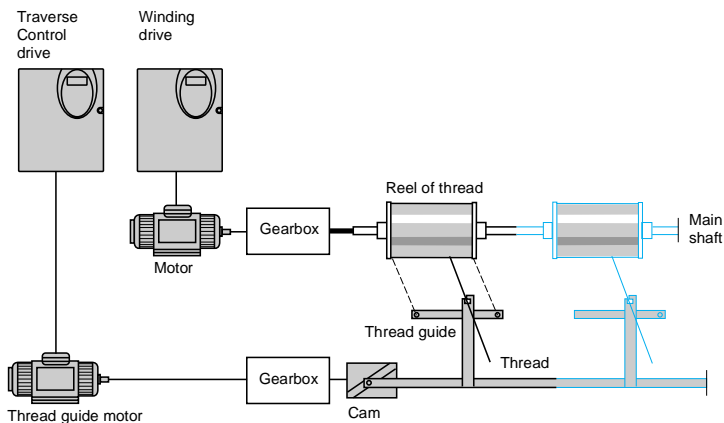
The cam rotation speed must follow a precise profile to ensure a steady, compact, linear reel is obtained.

The function starts when the drive has reached its base reference and the Traverse Control command has been enabled. When the Traverse Control command is no longer enabled, the drive returns to its base reference following the drive ACC or dEC ramp. As soon as this reference is reached, the function stops.

Function parameters
Using certain parameters, it is possible to define the cycle of frequency variations around the base reference, see opposite.

The Traverse Control (thread control) command can be assigned by a logic input or a bit in a Modbus or CANopen control word.

Reel management
Various parameters are used to manage the reel, such as the reel making time, the decrease in the base reference, reel changes, etc.

Main parameters necessary for reel management:
■ tbO: time taken to make a reel, in minutes. This parameter is intended to signal the end of winding. When the Traverse Control operating time since the command reaches the value of tbO, the logic output or one of the drive relays changes to state 1, to signal the end of the reel.
■ dtF: decrease in the base reference. In certain cases, the base reference has to be reduced as the reel increases in size.
■ rtr: reinitialize Traverse Control. As long as this parameter remains at 1, the Traverse Control function is disabled and the speed is the same as the base reference. This command is used primarily when changing reels.
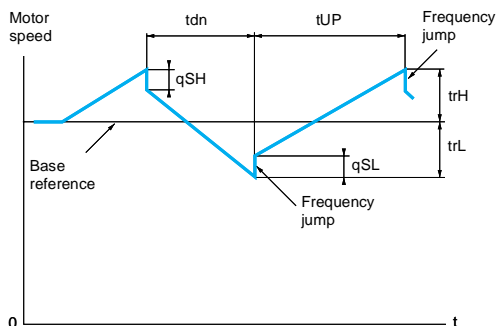
tdn: Traverse Control deceleration time, in seconds
tUP: Traverse Control acceleration time, in seconds
trH: Traverse frequency high, in Hertz
trL: Traverse frequency low, in Hertz
qSH: Quick step high, in Hertz
qSL: Quick step low, in Hertz

Definition of the cycle of frequency variations around the base reference
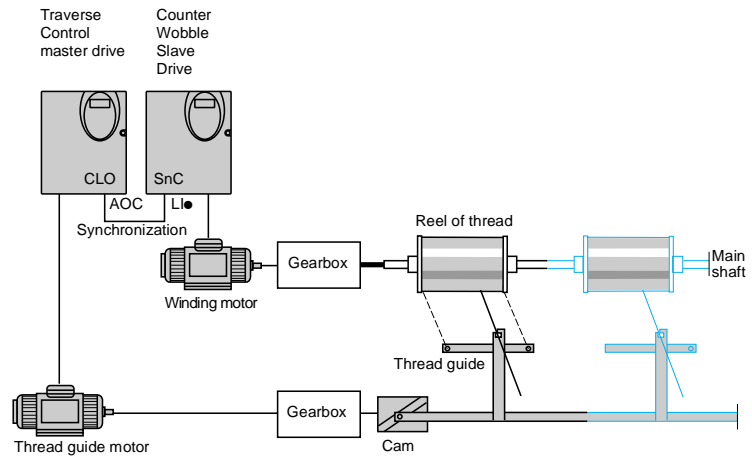
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■ **Counter Wobble**

The Counter Wobble function is used in certain applications to obtain a constant thread tension when the Traverse Control function is producing considerable variations in speed on the thread guide motor.

Two special drives, a master (Traverse Control) and a slave (Counter Wobble), are necessary for this function.

The master drive controls the speed of the thread guide, while the slave drive controls the winding speed. The function assigns the slave a speed profile, which is in antiphase to that of the master. This means that synchronization is required, using one of the master's logic outputs (AOC) and one of the slave's logic inputs (LI●).
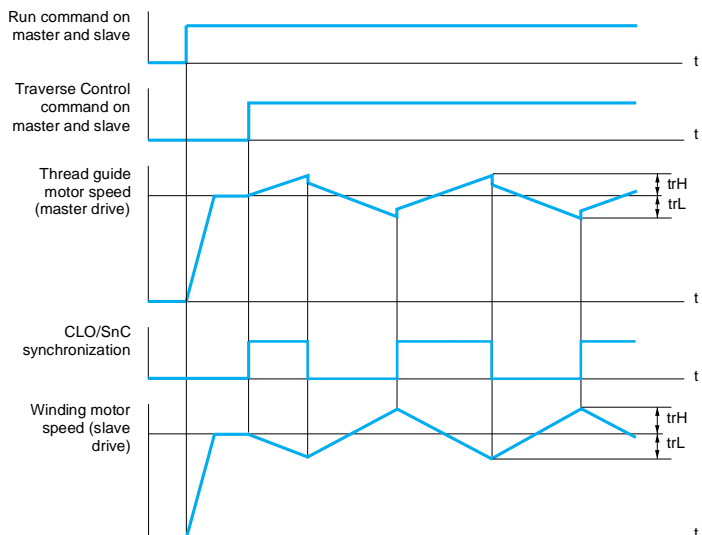
For the function to start, the following conditions must be met:
■ base reference of the motor speeds of the master and slave drives reached
■ "thread control" (trC) input activated
■ synchronization signal present

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Function compatibility table

■ **Configurable I/O**
Functions which are not listed in this table are fully compatible.
Stop functions have priority over run commands.
The selection of functions is limited:
   - by the number of drive I/O
   - by the incompatibility of certain functions with one another

Functions	Summing inputs	+/- speed	Limit switch manage-ment	Preset speeds	PI regulator	Jog operation	Brake sequence	DC injection stop	Fast stop	Freewheel stop
Summing inputs		⊜		↑	⊜	↑				
+/- speed	⊜			⊜	⊜	⊜				
Management of limit switch					⊜					
Preset speeds	←	⊜			⊜	↑				
PI regulator	⊜	⊜	⊜	⊜		⊜	⊜			
Jog operation	←	⊜		←	⊜		⊜			
Brake sequence					⊜	⊜		⊜		
DC injection stop							⊜			↑
Fast stop										↑
Freewheel stop								←	←	

⊜	Incompatible functions
	Compatible functions
	Not applicable

Priority functions (functions which cannot be active at the same time)

← The arrow indicates which function has priority

↑ Example: the Freewheel stop function has priority over the Fast stop function

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